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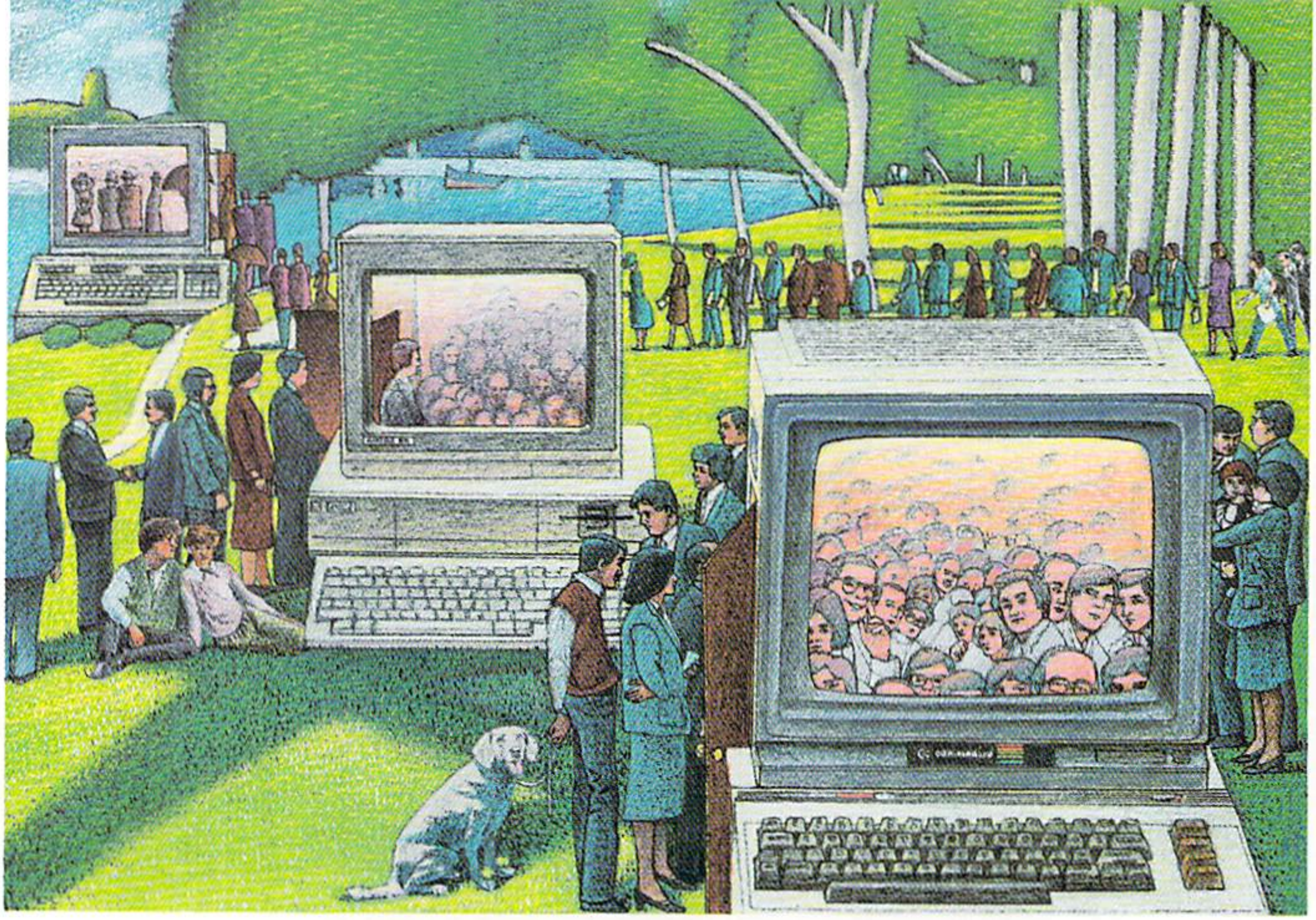
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JULY 1987

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When you're in the market for Commodore-compatible peripherals, you'll want to be sure to check out the prices from **Montgomery Grant.** Whether you're looking for a printer, a disk drive, or some other peripheral, **Montgomery Grant** is definitely one of the suppliers you should consider. Their prices are among the lowest in the country. When you're ready to buy from **Montgomery Grant,** be sure to clip the coupon on page 3 of this *Clipper,* because besides having fantastic prices, with every purchase over $100, **Montgomery Grant** will add a FREE GAME CARTRIDGE. Read their ad in this month's issue of *Ahoy!* for details about ordering. If you wish to place your order by phone, just call 1-800-345-7059, or in New York, call 1-212-594-7140. And don't forget to ask for your FREE GAME CARTRIDGE. This offer expires August 15th, so don't wait. Order TODAY!

FREE SOFTWARE WITH $10 PURCHASE FROM S & S...

S & S Wholesalers has very good prices, perhaps the best you'll find anywhere on Commodore and Commodore-compatible hardware and software. They're anxious for you to consider buying from them when you're in the market, so they're making you this exciting offer: When you clip the **S & S** coupon on page 3 of this *Clipper* and send it along with your order of at least $10, you'll receive 1 FREE piece of software! It's **S & S**'s way of motivating you to consider their good prices and excellent service. See their ad in this month's issue of *Ahoy!* If you're in a hurry, you may call them at 1-800-233-6345, or in Florida, call 1-305-538-1364. But be sure to mention that you saw this offer in the *Ahoy! Access Clipper,* so that you receive your FREE SOFTWARE. This offer expires on August 15, 1987, so mail your order RIGHT AWAY!

Ahoy! *Readers:*

Well, here we are again in the heat of the impending summer. My escape from the heat is to cloister myself in my air-conditioned study with my computer. Last summer I created some great programs to help run my friend's business. This summer, who knows!

In this Clipper, *you'll find some more wonderful offers to tempt you. The newest advertiser featured in this month's* Clipper *is* ***Montgomery Grant****. Even with their great prices, when you spend $100 or more they will include a FREE GAME CARTRIDGE.* ***AICP*** *is again offering a FREE DISK NOTCHER with the purchase of two boxes of disks. If you don't already own a notcher, be sure to take advantage of this offer.* ***Lyco Computer*** *is reducing the price of the Panasonic 1080i when you also purchase an applicable cable or interface.* ***S & S*** *is holding over their top notch FREE SOFTWARE OFFER, and* ***Emerald*** *is also in with a jewel of a dual offer. And there is much more, so be sure to read this* Clipper *carefully.*

See you in September with more dynamite offers for your consideration.

Admirally yours,

Joe Ferguson

Joe Ferguson
Director
Ahoy! *Access Club*

SAVE $5 ON A KRACKER JAX® PACKAGE FROM COMPUTER MART...

When I was a kid, I loved to buy boxes of Cracker Jacks, not for the confection, but rather for the surprise. This month **Computer Mart** has a cracker jack surprise offer for you, too. Their jim dandy copy protection program, *Kracker Jax*®, was reviewed in the January, 1987 issue of *Ahoy!* We liked it, and so will you. *Kracker Jax*® is a powerful parameter copy program which will allow your 1541 or 1571 disk drive to strip all copy protection from your expensive software, thus allowing you to use simple, fast copiers to make backups. You need never again pay for a backup to a program you already own. The cost of *Kracker Jax*® is only $19.95 for each volume. There are five.

But wait, there's more! There's also a book called *Kracker Jax*® *Revealed* which comes with a reset switch, a utility disk, and 20 parameters on a disk. The regular cost of the book is $23.50 complete. This valuable book reveals the secrets of unprotecting software, and includes a tutorial which has 20 specific examples to lead you step-by-step to a new level of knowledge about copy protection.

Computer Mart also has some other nifty software worth your consideration, so be sure to find their ad in this month's issue of *Ahoy!* **Computer Mart** wants you to give serious consideration to their *Kracker Jax*® package, so until August 15, 1987, you may take $5 OFF the combination of the book and a *Kracker Jax*® volume of your choice. Clip the **Computer Mart** coupon on page 3 of this *Clipper,* and send it with your order. This offer turns stale on August 15, 1987, so don't wait.

10% OFF WORLD CLASS LEADER BOARD FROM ACCESS SOFTWARE...

Having been immensely successful with *Leader Board (Pro Golf Simulator)*, then *Tournament Disk #1*, and finally *The Executive Disk #1*, **Access Software** proudly announces the introduction of *World Class Leader Board. World Class Leader Board* includes three famous 18-hole golf courses: St. Andrews, Scotland, the most revered course in golf; The Doral Country Club, the Florida Blue Monster; and Cypress Creek, Texas, the largest golf course in the U.S.

World Class Leader Board authentically reproduces these actual courses with trees, traps, ruff, and water hazards. The 4th course included is The Gauntlet Country Club. Only those who have mastered the best courses in the world can expect to come close to par on the Gauntlet.

World Class Leader Board features a scorecard printout, aerial views, a course editor (to arrange the holes in any order), a practice putting green, and a driving range. There are thousands of trees, up to 192 per hole. And the improved graphics and playability increase difficulty and realism.

I had a great time playing *World Class Leader Board,* and so will you. With a suggested retail price of $39.95, *World Class Leader Board* will challenge you with the same strategy and option decisions you face in a real game. And because the look and feel are so lifelike, it may improve your actual game as well.

Now and for a limited time, you may SAVE 10% on *World Class Leader Board* when you order it directly from **Access Software**. Use the handy **Access Software** coupon on page 3 of this *Clipper*, or you can call them at 1-801-298-9077 (please do not use their toll-free number!). Don't forget to mention you saw this offer in the *Ahoy! Clipper*, so that you get your discount. This offer expires on August 15, 1987, so hurry and place your order RIGHT NOW!

GREAT SAVINGS FROM EMERALD...

A rare emerald is a real find, and so is the new FSD-2 Disk Drive from **Emerald Component International.** The FSD-2 Disk Drive is a jewel of a drive. With a direct drive mechanism, as opposed to being belt driven like the FSD-1 and the Commodore 1541, the new FSD-2 features better reliability. This enhanced reliability is reflected in the 1-year warranty, not just 3 months offered by Commodore. The well-constructed FSD-2 has an external power supply, which virtually eliminates the possibility of overheating. It's about one-half the size of the Commodore drive, with a slim-line design and metal chassis. With an improved operating system, you'll find it's somewhat faster and quieter than the 1541. The FSD-2 even has a device number select switch. **Emerald** also has an excellent policy: Your SATISFACTION IS GUARANTEED.

Now and for a limited time, when you buy the FSD-2 from **Emerald Component International**, you may either have 10 FREE DISKETTES or take 30% OFF the Quickshot II Joystick. The Quickshot II usually sells for $19.95, but with the purchase of the FSD-2, you may have it for only $13. Simply complete the **Emerald** coupon on page 3 and send it with your order. Add $20 for shipping and handling. You may call 1-503-683-1154 to order with your credit card. But to get the savings, be sure to mention that you saw this offer in the *Ahoy! Clipper.* This offer expires August 15, 1987, so mail or phone in your order TODAY!

25% OFF OPERATION TERMINAL FROM DREAMRIDER

Because of our mistake in the March *Clipper*, we're continuing to feature a May offer on **Dreamrider**'s *Operation Terminal,* the first modem game you can play without paying a service charge or accessing a mainframe. **Dreamrider**'s *Operation Terminal* is a full-color, person-to-person search game. With *Operation Terminal*, you'll enter a world of fast action and espionage as you search the mysterious Antimatter complex for top secret documents. All you need is to have a modem, buy *Operation Terminal,* and link up with a friend who also has a modem and the game. As an introduction to this innovative concept, **Dreamrider** is offering a generous 25% DISCOUNT off the regular price of $39.95, so you'll pay only $29.95 for this groundbreaking software. Simply clip the **Dreamrider** coupon on page 3 of this *Clipper* and send it along with your payment. Add $2.50 for shipping and handling. But don't wait to order, 'cause this offer unlinks on August 15, 1987.

SAVE ON THE PANASONIC 1080i FROM LYCO COMPUTER

One of the best values in printers today is certainly the Panasonic 1080i. With speeds of 120 and 24 characters per second in draft and near letter quality mode respectively, the Panasonic 1080i comes with friction or tractor feed and has a 2-year warranty. It's an excellent value at **Lyco**'s regular discounted price of $195. But for a limited time, when you buy the Panasonic 1080i with any applicable cable or interface from **Lyco Computer**, you may buy this terrific printer for only $189.

In each issue of *Ahoy!*, you'll find two pages of great computer offerings from **Lyco Computer. Lyco** sells a wide variety of Commodore-compatible hardware and software at good prices. For more details on shipping and handling for the Panasonic 1080i and prices for applicable cables and interfaces, check out **Lyco**'s ad in this month's issue of *Ahoy!* To order your Panasonic 1080i and cable or interface, just clip the **Lyco** coupon on page 3 of this *Clipper.* For more information on printers and interfaces, you may call them at 1-800-233-8760; in Pennsylvania, call 1-717-494-1030. They will accept phone orders on this offer, but you must mention your membership in the Club. This offer expires on August 15, 1987, so hurry and complete the **Lyco** coupon right away.

PAY FOR FOUR MONTHS, GET A FREE MODEM FROM QUANTUMLINK...

QuantumLink is one of the better subscriber services for features like on-line games, live conferences, software reviews, and user group support. Their advertisement in this month's issue of *Ahoy!* will tell you how you may receive a FREE **QUANTUMLINK** MEMBERSHIP KIT when you subscribe to *Ahoy!* (Since you're probably already a subscriber, you may take advantage of this offer by extending your subscription.) For *Ahoy!* Access Club members, **QuantumLink** is making an additional offer: Get FREE **QuantumLink** software, plus a FREE 300-baud, auto-dial modem by paying for four months of **QuantumLink** Basic Service ($9.95/month) at $39.80. You may order by clipping the **QuantumLink** coupon on page 3 of this *Clipper*, or by calling them at 1-800-392-8200 and asking for Department 25. This offer expires August 31, 1987, so mail or phone your order TODAY!

DISK NOTCHER OFFER HELD OVER BY AICP...

Disk notchers are very handy gadgets. A disk notcher allows you to use the other side of your single-sided double-density disks by merely adding a notch in the right place. So effectively, you double your disk storage capacity.

This issue **American International Computer Products (AICP)** is holding over their FREE DISK NOTCHER offer. You'll get THE FREE DISK NOTCHER when you buy two boxes of **AICP**'s 1st quality, single-sided, double density disks at the very reasonable price of $7.95/box of 10 disks. (**AICP** also sells a wide variety of Commodore and Commodore-compatible hardware and software at prices worth looking at.) You will need to add $3.50 for shipping and handling, and New York residents need to add appropriate sales tax. Simply clip the **AICP** coupon on page 3 of this *Clipper* and send it along with your payment. Or you may call **AICP** at (800) 634-AICP, or in New York State at (718) 351-1864, mention you saw this offer in the *Ahoy! Access Clipper*, and order with your credit card. (Credit card orders are subject to a 4% surcharge.) But don't wait, 'cause this offer expires August 15, 1987.

FREE DISK NOTCHER FROM AICP

Mail to:
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Computer Products
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For faster service, call (800) 634-AICP, or in New York, call (718) 351-1864.

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Eugene, OR 97401

For faster service, call 1-503-683-1154.

YES, **Emerald**, I want to *either* SAVE 30% on the Quickshot II or have a FREE BOX OF DISKETTES. Enclosed is my order for the FSD-2 at $159, plus $20 for shipping and handling. I have indicated my choice of offer below. Thanks!

☐ I want to save 30% on the Quickshot II. Enclosed is my additional payment of $13, a total of $192.

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$5 OFF KRACKER JAX PACKAGE FROM COMPUTER MART

Mail to:
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YES, **Computer Mart**, I want to SAVE $5 on the *Kracker Jax* package of the book, *Kracker Jax Revealed*, and a *Kracker Jax* volume. My order is enclosed. My choices are: ☐ Vol. 1 ☐ Vol. 2 ☐ Vol. 3 ☐ Vol. 4 ☐ Vol. 5.

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YES, **QuantumLink**, I want my FREE MODEM AND SOFTWARE by paying now for four months of **QuantumLink** Basic Service ($9.95/month). My payment of $39.80 is enclosed. Thanks!

SAVE ON THE PANASONIC 1080i FROM LYCO COMPUTER

Mail to:
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P.O. Box 5088
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For faster service, call 1-800-233-8760. In PA, call 1-717-494-1030.

YES, **Lyco**, I want to buy the Panasonic 1080i Printer. My order for the printer and applicable cable or interface is enclosed.

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FREE GAME CARTRIDGE WITH $100 PURCHASE FROM MONTGOMERY GRANT

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New York, NY 10001

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YES, **Montgomery Grant**, I want to get my FREE GAME CARTRIDGE. Enclosed is my order for $100 or more. I have checked your ad for the details about ordering. Thanks!

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FEATURES

*Includes programs: *LED Driver*, LED.BAS, and *Optical Oscillator* (for the C-64 and C-128)

**Includes program: *Bit Map Tutorial* (for the C-64)

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VIEW FROM THE BRIDGE

Before we're accused of hyping all the good features of *Ahoy!* and glossing over the not-so-good, let it be said up front: we feel at least as bad as you do about the thinness of these summer issues. We don't have to tell you that ads bring in the money to pay for more editorial pages, and fewer companies advertise in the summer. Before long we'll be back up to size; until then, just read your favorite articles twice. You always miss something the first time through—at least, that's what our experience answering your programming questions has taught us!

We hope the July *Ahoy!* will make up for in quality what it lacks in quantity:

• While it doesn't happen as often as it used to, from time to time someone will still ask: "But what can you *do* with a computer?" Answer the question by demonstrating the hardware you'll build with this month's Rupert Report. Then explain to the infidel how we can make life easier by putting *Computers in Control!* (Turn to page 32.)

• The most revered authors in history...Cervantes, Milton, Stallone...have written sequels to their greatest works and fallen far short of their original success. But Bob Blackmer has broken the centuries-long schneid with *Wizard Tag II!* (Turn to page 22.)

• Once, people groused about incompatibility among different computer systems. Commodore silenced many of them by setting the semi-standard for home users. But the popularity of GEOS has intensified another long-standard problem: incompatibility among graphics packages. In this month's *Reviews* section, Morton Kevelson examines four commercial programs that enable the 64 owner to overcome this obstacle. (Turn to page 64.) Further insight can be gleaned from Morton's *C-64 Bit Map Graphics Tutorial.* (Turn to page 41.)

• We've seen computerizations of most of today's most popular board games. But Walter E. Meyers has reached back into the 19th century for *Plink & Plonk.* Ask your great-great-grandparents about The Man in the Moon, the once phenomenally popular contest on which P&P is based. (Turn to page 15.)

• Every time we think we've seen the best game that can possibly be compacted into a single *Ahoy!* page, one of our programmers proves us wrong. But as prepared as we were to have our thinking corrected once again, our mouths were still left agape by Robert Bixby's *Univaders!* (Turn to page 31.)

• And like all our best game programmers, Robert is happy to share the secrets of his success in these pages. An aid in emulating roulette and slot machines, *128 Scroller* will roll any number of lines on your 128's 40-column screen in four directions. (Turn to page 24.)

• The way Buck Childress keeps coming up with ways to make a 64 operate as efficiently as a 128, we expect him one day to submit a program to make the 64 flatten itself and turn white. (Come to think of it, could the second "C" in C-64C stand for...nah.) In the meantime, marvel at *Data Express*, which adds the 128's binary save feature to your 64. (Turn to page 28.)

• We're doubled over in pain just from reading about the martial arts programs profiled in *Enter, The Electronic Dragon,* this month's *Entertainment Software Section* feature. After play-testing the four new games for nearly a month, Arnie Katz and Bill Kunkel must be close to bedridden. (Turn to page 44.)

• Supplied in versions for the C-64 and C-128, Shawn K. Smith's *Data Creator* takes all the effort out of writing data statements for your programs.

Funny thing—after the above rundown, this issue doesn't seem so skinny at that. Still, here's to a fatter near future together.

—David Allikas

COMAL ON JULY AHOY! DISK

The flip side of July's *Ahoy! Disk* is given over entirely to COMAL programs. Included are a Wheel of Fortune game, a Generic Database, and many other programs, including the all-important COMAL 0.14 language.

For information on ordering the July disk, see page 65.

Take a Quiet Drive in the Fast Lane.



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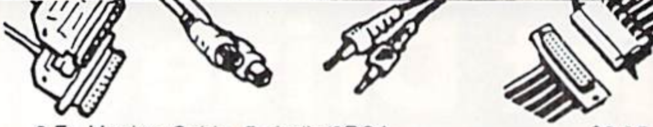
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AMIGA 500

Long rumored and finally unveiled at March's Hanover Fair in West Germany, the Amiga 500 performs exactly as an Amiga 1000 does, with the identical graphics, video, multitasking, and music capabilities. It differs from its predecessor mainly in design: the 500 incorporates the keyboard, CPU, and 3½" drive in one unit. Also in memory: the 500 comes with 512K RAM standard. Officially scheduled for release before the end of June, the 500 will list for $649 without monitor. That pricing sets up a number of interesting questions.

$649 is half the Amiga 1000's original list price of $1295. Within months, you'll recall, Commodore had lowered the list to $795. Before long retailers had discounted the machine further, to just above $900 with monitor.



Amiga 500: half the 1000's original list price, double its built-in RAM.
READER SERVICE NO. 103

Commodore may not have to similarly slash the 500's list price. At $649, which will translate into at least a hundred dollars less at the retail counter, the machine should be a much brisker seller than the 1000. On the other hand, many of the hard core home computerists, the hundreds of thousands of people who would wait in line in the rain to buy a 500 at $649 (raise your hands), have already bought 1000's. If not enough of them remain without Amigas to get the 500 off to a quick start, and Commodore is inclined to slash the 500 proportionally to the 1000 —that is, by $250, reducing it from $649 to $399—the machine's list price will easily undercut the current street price of a C-128 and 1571 drive.

Few users will opt for a C-128 system over a 500 unless the former's list price is substantially reduced—which of course it will be. How low can it go will determine how long the 128 and 64C continue to be manufactured. Why doesn't Commodore just bag its 8-bit machines now, when it's clear that Amiga is their future? There's more money to be made by selling a consumer a system that he'll eventually want to replace than by selling him the superior one in the first place. Commodore kept manufacturing VIC 20's long after any but the completely naive were taking them home, and there's no reason to doubt that they'll do the same with the 128 and 64C. Which is, of course, doing nothing more than following the laws of capitalism that made this country great and its credit card companies rich. But if you have a friend about to invest in his first computer, do advise him of the outstanding value scheduled to come available shortly after these words see print.

Commodore/Amiga, 215-431-9100 (see address list, page 13).

PLUS/4 ADDITIONS

We admire a company that shows a dead horse no mercy. In addition to the joystick cables mentioned in April's *Scuttlebutt*, R.M. Harris has made an entire line of Plus/4 and C-16 products available to users, much of it imported from Europe.

Games for the Plus/4: *Classic Bridge*, *Football Manager*, *Grand Master Chess*, and *Wimbledon*, $19.95 each.

Games for the Plus/4 and C-16 (specify choice): *Indoor Soccer* ($13.95) and *World Series Baseball* ($19.95).

And utilities for the Plus/4 only:

Turbo Plus Cartridge ($39.95) speeds up BASIC load times and adds commands like Find, Change, Dump, Old, and Kill.

Music Master ($29.95 tape/$34.95 disk) turns the Plus/4 into a synthesizer and sequencer, with 10 preprogrammed rhythms and patterns.

Paint Box ($24.95 tape), a hi-res drawing program, includes frame, box, fill, plot, and other commands.

Graphic Designer ($21.95 tape/ $24.95 disk) permits character design with editing features like Flip, Reverse, Turn, and Exchange, plus animation.

3 Plus 1 ($17.95 tape) makes it possible to use the Plus/4's built-in soft-

ware with a cassette player.

R.M. Harris Company (see address list, page 13).

CAD AND MOUSE

Abacus has enhanced its *Cadpak* drawing and graphic design software for the C-64 and C-128 to support the 1351 mouse. If you purchased *Cadpak* after February 1, 1987, you're entitled to a free upgrade; earlier owners can upgrade for a nominal charge.

Abacus Software, 616-241-5510 (see address list, page 13).

FORM AID

Diskforms consists of five predrawn, customizable forms for use with *GEOS*, including delivery receipt, bank deposit form, inventory form, and a file that can be used to build custom forms from scratch. Like *Diskart 1, 2,* and *3* (see last month's *Scuttlebutt)* of *GEOS*-compatible graphics, the price is $8.50.

Those Designers, 213-427-6742 (see address list, page 13).

CLASSICS ILLUMINATED

Strider's Computer Classics, a new music series from Free Spirit, includes commentary from classical musician Lorne Strider. Each disk contains about one hour of music and about 40 screens of commentary. The first three releases are *Fifteen Bach Inventions, The Well Tempered Clavier,* and *Mozart Sonatas.* Price is $9.95 each, two for $17.95, or three for $24.95. Shipping is free.

Free Spirit Software, Inc., 312-352-7323 (see address list, page 13).

TELECOM NEWS

Abacus has established a permanent presence on QuantumLink, providing information on new products and upgrades, a Q & A Forum to answer commonly asked questions, and help with individual technical questions and product inquiries.

Abacus, 616-241-5510; QuantumLink, 703-448-8700 (see address list, page 13).

Computer Entertainer has set up a 24 hour, 7 day bulletin board. Modem owners can call 818-766-6442 (data 8-1-N) to read selected news stories and reviews from recent months, or download at 300, 1200, or 2400 baud.

Computer Entertainer, 818-761-1516 (see address list, page 13).

Aegis's Amiga Telecommunications program, *Diga!* ($79.95), will incorporate their new Doubletalk file transfer capability. Doubletalk permits communication with the aid of high speed two-way packet file transfer, allowing two users to "talk" even while sending and receiving files. 512K is required.

Aegis Development Inc., 213-392-9972 (see address list, page 13).

GEOGRAPHY GAME

Second in Broderbund's mystery exploration series, *Where in the U.S.A. Is Carmen Sandiego?* ($39.95) lets players of all ages enhance their knowledge of geography while they track members of Carmen's gang through the 50 states. The game includes 16 villains, 51 locations, animation, onscreen USA map, save feature, and 10 levels of difficulty. Thrown in are a 460 page Fodor's U.S.A. Travel Guide for researching clues, Carmen's Scrap Book, and a U.S.A. map.

Broderbund Software, Inc., 415-479-1700 (see address list, page 13).



Running the program underwater may bring on a nasty disk error, but used on dry land the **128 Computer Diver's Log** *serves as a diary of maritime memories. READER SERVICE NO. 113*

UNDERSEA 64

The *128 Computer Diver's Log* improves upon the previously released C-64 version mainly in terms of the 128's increased speed and disk access. The program lets frogpersons keep a scuba or skindiving log on their computer, recording a minimum of 132 dives on one disk. It's possible to search for dives by location name, review any part of the log by dive number, list dive locations, and print out any part of the log. Price of the C-128 version is $37.95 postpaid (in CA add $2.27); the 64 version, $27.95 (in CA add $1.62).

PC Fuel Co., 415-349-9702 (see address list, page 13).

GAME RELEASES

Phantasie III: The Wrath of Nikademus ($39.95), promised to be the last C-64 confrontation with the Dark Lord of the same name and his army of vile beasts and creatures, boasts such advantages over earlier installments as a detailed method of handling wounds that determines location and extent of injuries, more strategy and combat options, enhanced graphics, and increased playing speed. Players can also reuse favorite characters from previous *Phantasie* games.

Strategic Simulations, Inc., 415-964-1353 (see address list, page 13).

From Electronic Arts:

World Tour Golf ($34.95) includes such famed courses as Scotland's St. Andrews, Georgia's Augusta, and California's Pebble Beach. C-64 duffers can choose one of the 12 courses provided or build their own, placing hills, bunkers, trees, and water hazards and designing green slopes and background skyline. Up to four players can compete, or one player can take on three computer opponents, setting attributes like handicap, strength, club skills, and hook and slide tendencies for each. Split screen animated graphics give both overhead and golfer's-eye views of each hole.

A new version of *Ultima I* for the C-64 features improved graphics and animation and faster gameplay, including an arcade action sequence.

Written in story form, *The Destiny Knight Cluebook* ($12.95) aids players of *The Bard's Tale II* by taking them through all 25 dungeon levels and providing hints for encounters with various puzzles.

Electronic Arts, 415-571-7171 (see address list, page 13).

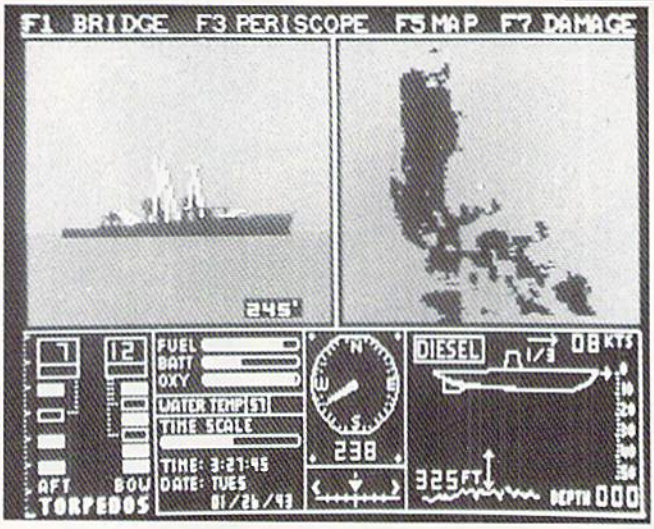
Two for the 64 from Free Spirit:

Wheel & Deal ($19.95) lets 2 to 6 players cut real estate deals, charge exorbitant rents, chisel landlords, take opponents to court, speculate in the stock market, and more—the idea being to amass a fortune while driving your opponents to bankruptcy.

The Weapon of Choice ($29.95), a text adventure featuring explicit subject matter and text that are recommended for mature audiences only, posits the player as a young man of the plains seeking to build a reputation in a land not yet called America. Knowledge of Indian lore and legends, provided in the manual, assists the player in his quest.

Free Spirit Software, 312-352-7323 (see address list, page 13).

Two oldies for the C-64 imported from abroad by Eurosoft International,



Split screen and instrument panel of **Up Periscope!** *give you all vital information at a glance. All land masses and islands are properly located.* READER SERVICE NO. 114

each $24.95:

The *Jump Jet* flight/combat simulator stars the Sea Harrier VTOL (Vertical TakeOff and Landing) fighter. After taking off from an aircraft carrier, the pilot uses the onscreen instrument panel's radar and range finder to locate enemy aircraft, then destroys same with Sidewinder air-to-air missiles. Audible warning messages are sounded via the 64's voice and sound capabilities.

The six adventures that comprise *Valhalla* take place within the world of Norse mythology. Players interact with 36 animated characters in pursuit of lost treasure. Each character may either help or hinder your quest through 81 different locations.

Eurosoft International, 203-838-9890 (see address list, page 13).

Up Periscope! ($29.95) puts the player in charge of a WWII fleet class submarine assigned to patrol the Atlantic and Pacific oceans. Any of 14 historical situations can be relived, or original adventures can be embarked upon. Potential targets for attack include enemy freighters, tankers, troop ships, destroyers, and battleships. Weapons range from Mark 10 to advanced but unproven Mark 18 torpedoes. Other destructive details include surface and attack radars, variable-power periscope, torpedo data computer, and detailed charts. For the 64.

ActionSoft, 217-398-8388 (see address list, page 13).

Actually a computer simulation, *Def Con 5* ($19.95) lets the player operate his C-64 as though it were linked to an SDI (Strategic Defense Initiative) system. He controls 16 orbiting visual reconaissance satellites which provide 23 different geostationary and closeup maps of the earth's surface. Through a series of command and operator control functions, the player utilizes the system to defend against incoming enemy ballistic missiles.

Cosmi, 213-835-9687 (see address list, page 13).



Start with night patrols, then advance to daylight periscope-depth attacks.

BIORHYTHMS

Fun Biorhythms will print personalized biorhythm charts with a C-64 and compatible printer. By entering his birthdate and the current date, the user can generate physical, emotional, and intellectual cycles for the next 10 to 100 days. Price is $9.95 postpaid.

Free Spirit Software, Inc., 312-352-7323 (see address list, page 13).

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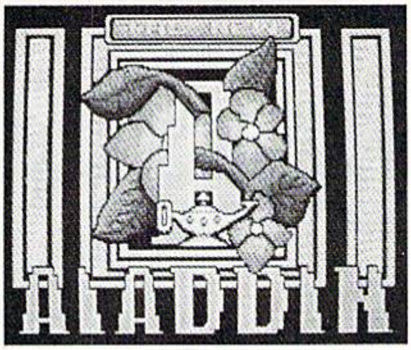
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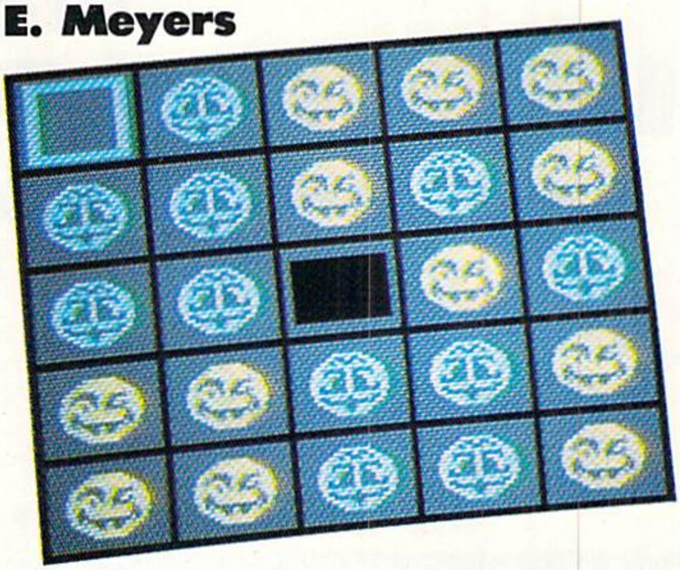
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PLINK & PLONK

For the C-64

By Walter E. Meyers



Plink & Plonk is a revival of an immensely popular nineteenth-century board game called "The Man in the Moon." It's a strategy contest for two players, using a joystick in Port 2. The objective, as in checkers, is to win the game by eliminating your opponent's counters.

THE GAME

In the first part of the game, the Placement Segment, each player places twelve counters, one at a time, in any of the empty boxes on the board. When the program prompts you, use the joystick to move the colored square to the box where you want your piece to be, then press the fire button. Your counter will appear in the box, and it's your opponent's turn.

When all the counters have been placed, the Capture Segment begins.

The rules of *Plink & Plonk* are simple: a counter may be moved one square in any direction–horizontally, vertically, or diagonally. At the beginning of the game, only the center box will be vacant. The first player's only possible move, therefore, will be to move a counter into that spot. The movement routine is almost the same as in the Placement Segment. First, move the colored square onto the piece to be moved and press the fire button. A special 'move' piece will appear. Move to the box where you want to place your counter and hit the fire button again, and the piece will appear.

Unlike checkers, in which you capture an enemy piece by jumping over it, you capture in *Plink & Plonk* by outmaneuvering your opponent. One or two enemy counters lying in a straight line between two friendly counters are captured. The program will remove them from play. Your objective, therefore, is to "bracket" your opponent's counters by catching them between two of your own pieces.

THE PROGRAM

The lengthy data statements give the computer instructions for several routines. The first set, beginning at line 5000, supplies the frequencies for the musical accompaniment to the opening title. They'll be used several times, so they've been placed at the beginning of the data statements, available for use after a RESTORE command is given. The next set, lines 5100-5137, supplies the data for four sprites that are used in the game.

The program uses two machine language subroutines; the numbers that the program POKEs for these subroutines are contained in lines 5200-5218. The first of these transfers the character set in ROM into RAM so that it can be modified. The second (starting at 49188) is the subroutine that reads the joystick and moves the sprites.

Finally, the last set of data, lines 5300 to the end, supplies the numbers used to modify the character set.

The program switches screen memory from bank 0 to bank 3; the important lines here are 230 to 270. The command SYS 49152 copies the Commodore's built-in character set. The POKEs in line 230 and 240 tell the program where to find the character data and where screen memory has been moved. ☐

SEE PROGRAM LISTING ON PAGE 92

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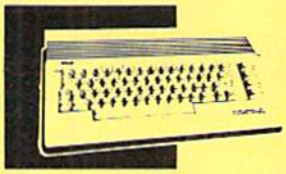
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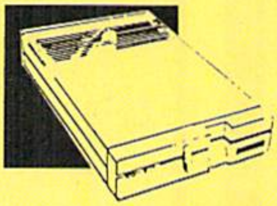
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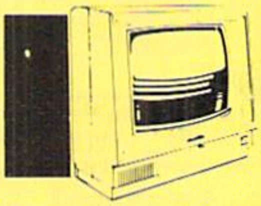
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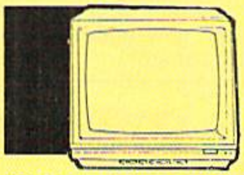
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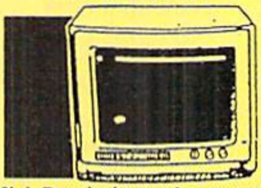


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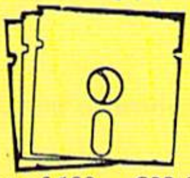


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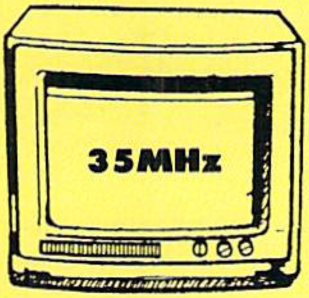
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WIZARD TAG II

For the C-64

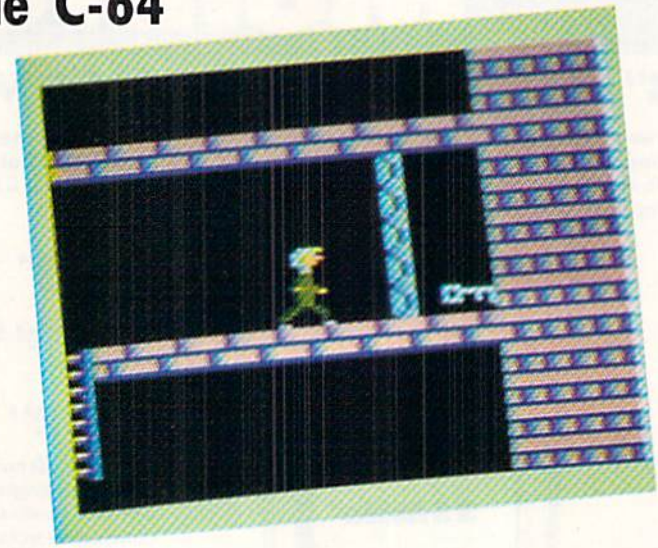


PHOTO: MICHAEL R. DAVILA

By Bob Blackmer

Wizard Tag II is a sequel to *Wizard Tag* (March '87). This is the first time I have written a sequel to one of my games. It should not be taken as an indication that I've run out of ideas. This program is in response to a challenge from a reader who finished 17 levels of *Wizard Tag*, adding that he could have done so with one arm tied behind his back. The sequel is true to the original in gameplay except that it is much bigger, with more dangers, and you must complete your mission against a clock.

You must gather eight keys from the castle before tagging the wizard. The vines continue to impede, but they are no longer killers, merely thrashing you about and flinging you to the ground floor. A sequel should also contain new dangers for the player. Three floors of the castle are inhabited by snakes. When you run into one of these serpents, they will trip you up and drag you across the castle floor, robbing you of precious time. There are twelve floors to the castle. You will start out on the ground floor with 2½ minutes on the clock.

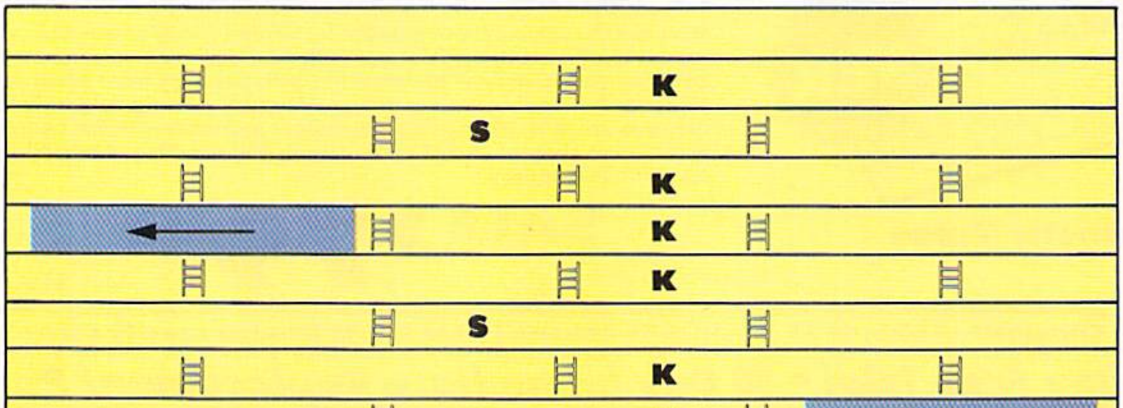
Looking at the map shown here, you can see the layout of the castle. Each floor marked with a 'K' will contain one key. The three floors marked with an 'S' will contain a snake that travels the length of the castle floor. Somewhere on the top floor will be the wizard. The shaded areas on floors four and eight show where the vines travel and in what direction. The keys on these two floors are in fixed positions. To be able to win the game, you must figure out how to get the key and avoid the vine.

After gathering all the keys, get to the top floor and tag the wizard. Bonus time will be added to the clock, and the wizard will again show his musical prowess on guitar. The time added will decrease and the speed of the vines and snakes will increase as you complete a level. Complete the levels as fast as you can, building up your time when the snakes and vines are easy to elude. Be careful with the vine on the eighth floor. It's quite a fall from here and it takes valuable time to get back up.

If any reader wins this game (you'll know when you do), write me care of *Ahoy!* with the winning message exactly as it appears, along with level completed and time left on the clock. The reader with the best time will play test my next game, which I'll write with one arm tied behind my back, and receive a prize to be announced.

Wizard Tag II is written in machine language and must be entered using *Flankspeed* (see page 83). After typing in and saving *Wizard Tag II,* reset the computer and LOAD "WIZARD TAG II",8,1. Then SYS 49152 to start. □

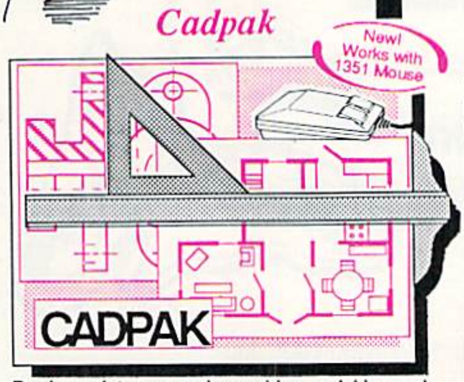
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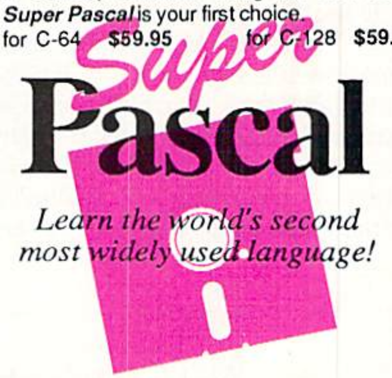
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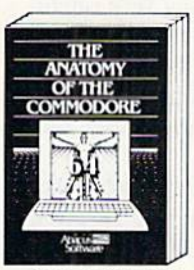
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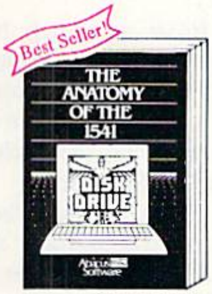
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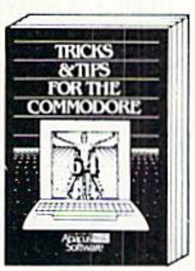
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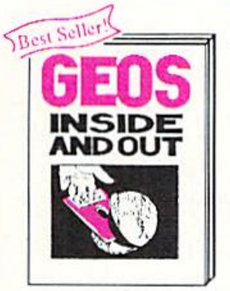
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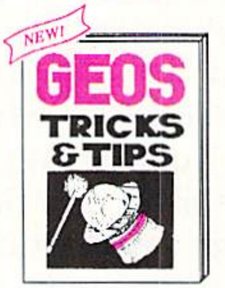
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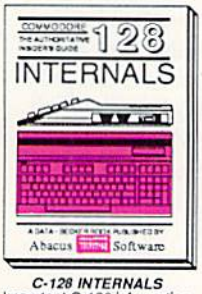
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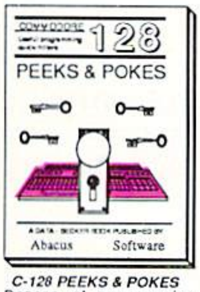
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128 SCROLLER

Four-Way Text Screen Scroller for the C-128

By Robert Bixby

Any number of 40 column Commodore 128 screen lines can be scrolled in four directions with *128 Scroller.* Using it, you can emulate slot machines and roulettes. I've written a simple game called *Fast Shuffle* to demonstrate its use.

To use *128 Scroller*, you must send two SYS commands from BASIC. The reason is that the 128 handles SYS commands in an idiosyncratic way. It places the first four parameters after the SYS in the Accumulator, the X and Y registers, and the Status Register, respectively. I needed to pass five parameters to the machine language program, and there was no simple way to do it. Furthermore, passing random values to the Status Register is a very good way to crash the computer. The SYS commands are:

```
SYS4864,<top line of scroll area (0-23)>
,<bottom line of scroll area (1-24)>,<le
ft column of scroll area (0-38)>
```

```
SYS4882,<right column of scroll area (1-
39)>,<direction of scroll (0=left, 1=rig
ht, 2=up, 3=down)>
```

An alternate way to pass values to the program is to

```
POKE4867,<top line>:POKE4868,<bottom lin
e>:POKE4869,<left column>:POKE4870,<righ
t column>:POKE4871,<direction>:SYS4882
```

It is virtually impossible to crash the machine language routine. The routine simply reverts to preset defaults if illegal values are entered.

Directions for entry:

Enter *128 Scroller BASIC* as written, being very careful to include all symbols, spaces, and trailing commas. Every symbol is significant. When the program is entered, save a copy and then run it. It will create an object file called 128SCROLLER on disk. To use the machine language routine, enter BLOAD"128SCROLLER.

I have included a sample game, *Fast Shuffle*, which makes use of the scroller to shuffle 32 tiles. You will be given the choice of easy and hard levels of play. At the easy level, the object is to push and pull the rows and columns of tiles into numerical order in the shortest time with the fewest moves. You are given an extra row of null tiles, which makes the game very easy. At the hard level, the object is to get as many of the tiles in order as you can. I believe it is impossible to get them all in order at the hard level.

While you are deciding what level to choose, the program will continuously shuffle the tiles. When you choose the level of play a red hand will appear which points in the direction of movement. To change the direction of movement, press the asterisk key (*). To move the row or column of tiles, press the space bar. Use the cursor keys to move the red hand. Younger players may want to arrange the colored tiles in patterns. □

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DATA EXPRESS

For the C-64

By Buck Childress

Did Rip Van Winkle invade my soul or is Father Time enjoying the new patch of gray on my head? I could have sworn it was 1984 when I began loading that last data-bloated program.

I confess! I do my share of complaining over the slowness of the datasette and 1541 disk drive. But, when you take into consideration the low price and excellent quality of the C-64 and its goodies, an occasional delay really isn't too much to ask. However, there is something you can add to Ol' Reliable's arsenal that will definitely speed things up, as well as free up space on your disks and tapes.

Data Express adds the new binary save feature of the C-128 to your trusty C-64. Now you're able to save machine language and sprite data directly from memory, using either disk or tape drive. You can eliminate those huge BASIC loader programs—the ones that POKE a mountain of data into memory while you fall asleep. By eliminating the loaders, you end up with pure ML and/or sprite files. The new files are a fraction of their original size. This means faster load times and a lot less storage space will be used on your disks and tapes. And, since you won't have to wait for a BASIC loader to POKE data into memory, you'll save even more time. I have a 14,500 byte ML program, in BASIC loader form, that shrank to 3200 bytes when I made a binary save. That's a big difference in time and space, especially with tape drive. I hardly have time for a good yawn before it's loaded and ready to go.

At the risk of putting my foot in my mouth, *Data Express* uses a BASIC loader to POKE its data into memory. However, it's relatively short and requires very little time to load. The loader lets you place *Data Express* wherever you want in memory. It currently loads into free RAM from 53000 to 53239. The variable S in line 40 sets the load address. If you want to relocate it (maybe you have another program in that area), just change S. Be sure you have enough room in your new area. If you want, you can make a binary save of *Data Express* once it's in memory. The binary file will load in no time. Here's how to use *Data Express*.

After you've saved a copy, run it. The loader POKEs the data into memory and checks for errors. Depending upon where in RAM you're loading *Data Express* (the default setting is 53000), you'll be given a corresponding SYS address. To activate *Data Express* (using the default setting), type SYS 53000, then press RETURN. If you relocate *Data Express*, remember to SYS to the new address. Another SYS to the starting address will deactivate it. The first SYS switches it on, the second SYS switches it off, etc.

Once activated, *Data Express* sits quietly in memory waiting for you to signal a binary save. It won't interfere with normal saving and loading. The syntax for making a binary save is:

```
S"DATA EXPRESS",8,53000,53239  (for disk)

S"DATA EXPRESS",1,53000,53239  (for tape)
```

Type S rather than SAVE. This tells *Data Express* you want to make a binary save. The filename can be up to 16 characters long. After the filename comes the device number—8 for disk drive, 1 for tape drive. Now enter the starting address followed by the ending address of the area you want to save. Our example uses 53000 and 53239 respectively, but these can be any area you want. Be sure you use commas as shown. The example would save *Data Express* as a binary file. *Data Express* saves everything in whatever address range you specify.

Your new files are loaded by typing:

```
LOAD"DATA EXPRESS",8,1  (for disk)

LOAD"DATA EXPRESS",1,1  (for tape)
```

Don't forget to add the 1 at the end. After loading, type NEW, then press RETURN. This resets important pointers without harming your program.

Data Express adds a new dimension to Ol' Reliable. Use it today and keep Rip Van Winkle away. □

SEE PROGRAM LISTING ON PAGE 88

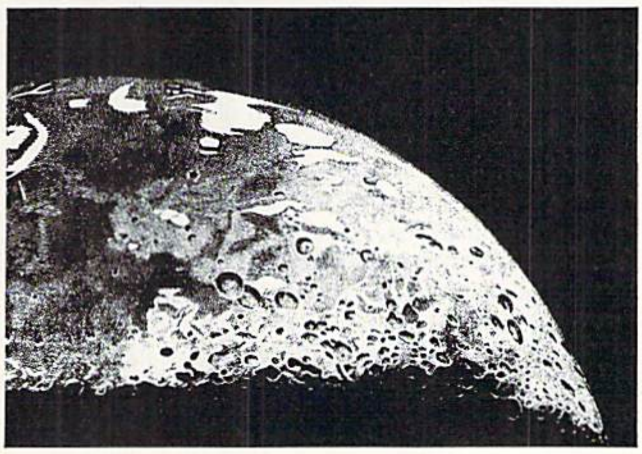
Reader Service No. 283

UNIVADERS
For the C-64

By Robert Bixby

The time is the near future. The place is a lonely outpost on Charon, the sole moon of Pluto.

Invaders appear on the screen shortly before midnight. You have barely enough time to load the missile launcher before they begin landing. They come in waves that won't quit. The entire incident lasts only about 100 seconds, but it seems like 100 years.



The good news and bad news: when you destroy a Univader craft, you earn 10 points (registered in the counter at the lower left of the screen), but when a Univader lands, you lose 10 points. The concussion bombs they drop can only destroy your gun if they make a direct hit, but you only get four guns.

When all your guns are gone, the game is over (the guns are counted down in the lower right corner).

Most agonizing of all is watching the timer. The seconds crawl down from 100.00 to 0.

PROGRAM ENTRY

First enter the UNIVADERS BASIC listing on page 96. I have made it as easy as possible to enter.

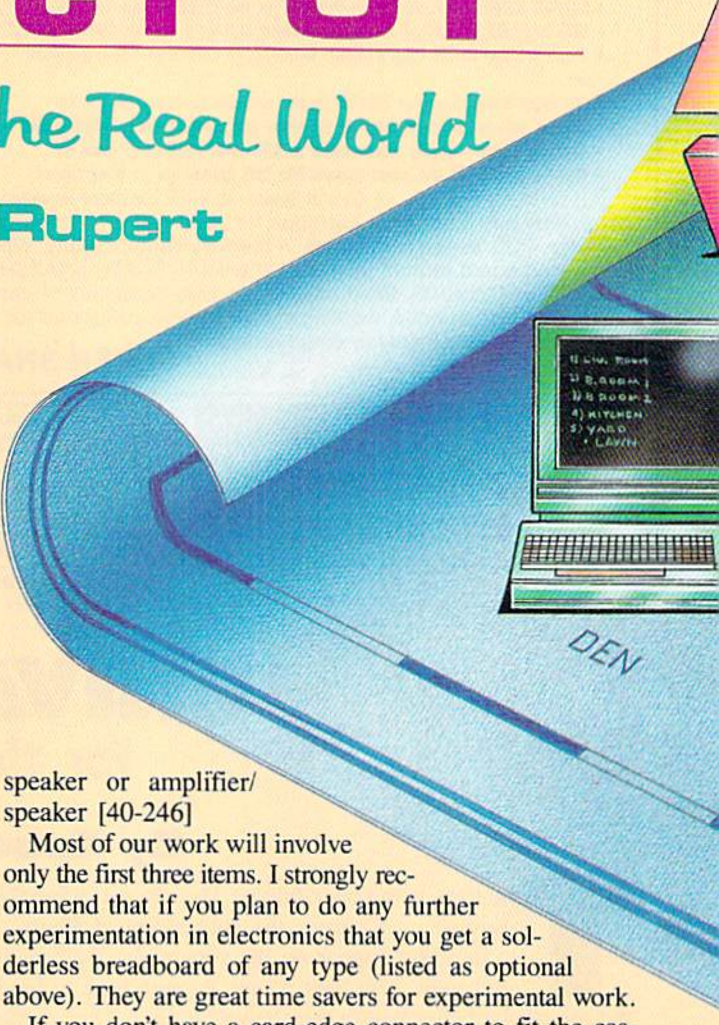
When the program is entered and saved to disk, run it. When UNIVADERS BASIC is done running, you will have a machine language file (UNIVADERS) on disk. This version will be much easier to use than a BASIC loader because it loads very quickly. You can make copies of it on other disks—just slip in a formatted disk anytime UNIVADERS is in memory and save it like any BASIC program. ☐

SEE PROGRAM LISTING ON PAGE 96

Computers in Control

Manipulating the Real World

By Dale Rupert



Computers may be classified as either processing devices or control devices. Most of our applications (file manipulation, number crunching, and graphics) have been of a processing nature. Using the computer as a control device allows us to monitor and manipulate the world outside the computer.

In a previous article we used the computer to monitor the external world. In *Analog to Digital Adventures (Rupert Report,* October 1986) we measured light intensity by using the analog-to-digital converter which is accessible through the joystick port. That article dealt with the computer as an input device.

This month we will use the computer primarily as an output device. We will use an output port of the computer to control the intensity of a light emitting diode (LED). To provide you with ideas for further exploration, we will experiment with sound and also build an optical oscillator.

Although our activities are primarily for fun and entertainment, the basic principles behind our work this month (Boolean algebra and bit manipulation) are relevant to all microcomputer controller applications. Controlling the brightness of an LED requires several of the techniques used in motor control and robotics.

BRING ON THE LED

To participate in the activities, you need a few electronics items. If you have an interest in electronics but don't know where to begin, this is the place. Here is a list of components we will use this month. (Representative Radio Shack part numbers are given in brackets. None of the parts are critical, and any source will do.)

LED–any type [276-041 or 276-1622]

Resistor–1000 ohms (1K), any power [271-023]

Connector–cassette port, 0.156 inch spacing, card edge socket, 12-pin [276-1551: see article for necessary modifications]

Connector–joystick port, 9-pin "D" submini, female [276-1538]

Photocell–cadmium sulphide (CdS) [276-116 or 276-1657]

Miscellaneous: hookup wire, solder.

Optional: solderless breadboard [276-175], any type loudspeaker or amplifier/speaker [40-246]

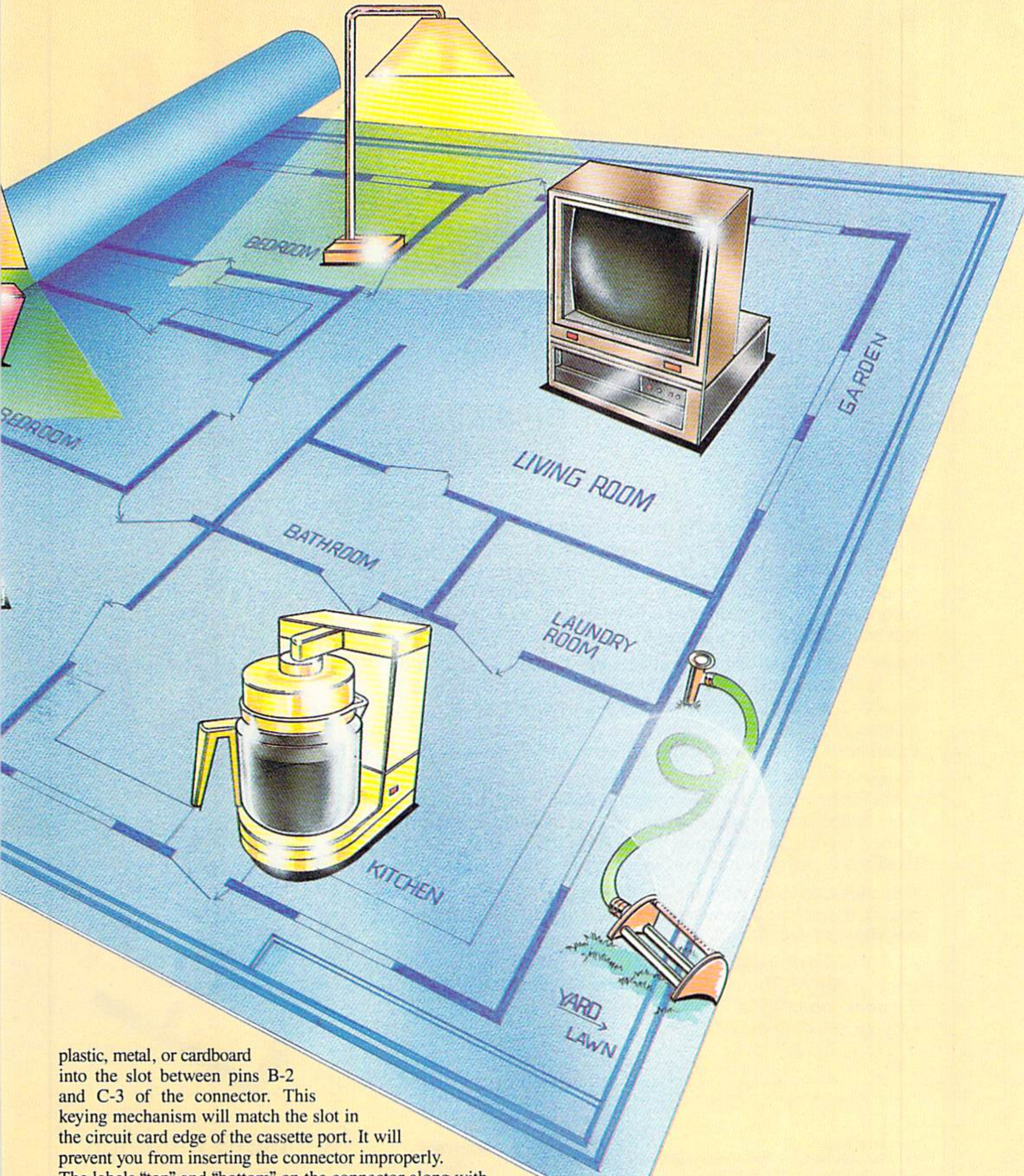
Most of our work will involve only the first three items. I strongly recommend that if you plan to do any further experimentation in electronics that you get a solderless breadboard of any type (listed as optional above). They are great time savers for experimental work.

If you don't have a card-edge connector to fit the cassette port, you can do the following. Get the 44-pin connector (or equivalent) listed above. Use a hacksaw to cut it into two pieces. Cut it so one piece has the six pairs of pins needed for the cassette port. (Cut through the middle of pin 7).

You may cut a few more pins off of the longer piece of the connector so that you also have a twenty-four pin connector (twelve pairs) which fits the user port. Save that connector. We will discuss the user port in a future column.

Label the top and bottom of the cassette port connector. It doesn't matter which is which since opposite pairs of pins are connected inside the computer anyway. Solder a wire roughly a foot long to pin A or pin 1 (ground). Pins A and 1 (referred to as A-1) are on the left end of the connector when you look at its solder-tail side.

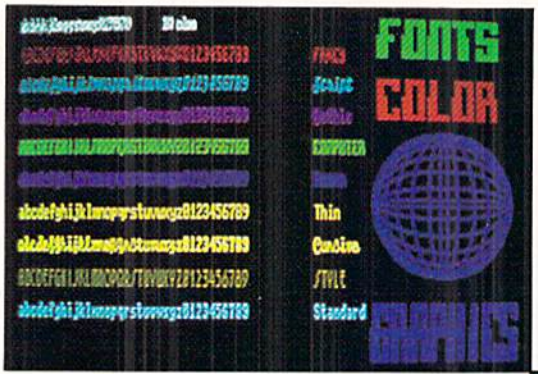
Solder another wire the same length to pin C or pin 3 (cassette motor output). You should push a thin piece of



plastic, metal, or cardboard into the slot between pins B-2 and C-3 of the connector. This keying mechanism will match the slot in the circuit card edge of the cassette port. It will prevent you from inserting the connector improperly. The labels "top" and "bottom" on the connector along with the pin numbers are also helpful.

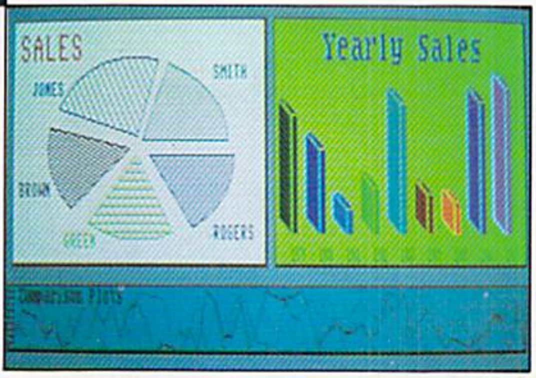
The wire from pin A-1 (ground) should go to the cathode of the LED. The cathode pin of the LED is usually next

ILLUSTRATION BY LINDA R. RICHARDS



Introducing BASIC 8

By Lou Wallace & David Darus



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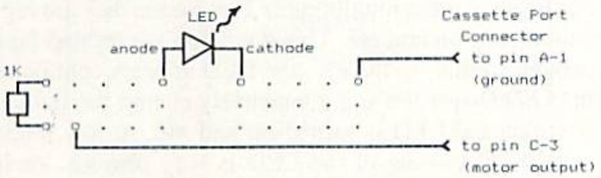
Reader Service No. 295

to a flattened edge on the plastic skirt of the LED. Sometimes the cathode is identified by being a different length than the other lead, called the anode. The cathode is usually the larger piece of metal inside the LED, if you can see through the sides of the LED.

Don't apply too much heat to the leads of the LED if you solder wires to it. Attach one lead of the 1K resistor to the anode of the LED. The other lead of the 1K resistor goes to the wire from pin C-3 of the connector (cassette motor output).

Figure 1 shows a possible arrangement of components using a solderless breadboard. Six groups of five tie-points are shown. The five tie-points in each horizontal group are interconnected but electrically isolated from all other groups. For example, the top lead of the 1K resistor is electrically joined to the anode of the LED. The bottom lead of the resistor is connected to pin C-3 of the connector. The cathode of the LED is connected to pin A-1 of the connector, just as described above.

FIGURE 1—Connect an LED to the Cassette Port



When the cassette motor output is turned on, pin C-3 of the cassette port is at + 9 volts with respect to ground at pin A-1. There is roughly a 2 volt drop across an LED. The 1000 ohm resistor limits current through the LED to a reasonable amount:

(9 volts − 2 volts) / 1000 ohms = 0.007 amp

This is 7 milliamps (7 mA) which is well within the rated current of most LEDs. Too much current can burn out the LED. (Unlike an incandescent light, the LED doesn't glow because of a heated filament. However there is a thin wire from the cathode to the anode which will burn up if too much current goes through it for too long.)

ON WITH THE SHOW

Just a word of caution before we begin. None of the experiments we will do, if done as described, pose any danger to you or your computer. On the other hand, any time you connect things to the computer, there is a chance that something is misconnected, and certain combinations of misconnections can damage components within the computer. This is not to scare you, but just to urge you to take your time and double-check all connections before plugging anything in.

Since our circuitry is very uncomplicated, I would suggest that if things don't work as described, you should be more suspicious of your mis-typing the programs than of mis-wiring the hardware. With these simple circuits, typing errors are more likely than wiring errors.

The *LED Driver* program on page 88 provides a means not only of turning the LED on and off, but of experimenting with the frequency and duty cycle of its operation.

The procedure to turn on the cassette motor output is somewhat complicated. The clues came from the book *Mapping the Commodore 128* by Ottis Cowper (COMPUTE! Books, 1986). The sequence involves clearing bit 4 of memory address 1 so that it appears that a button has been pressed on the cassette recorder (Datasette). A non-zero value must be put into the motor interlock at address 192 so that the normal timer interrupt IRQ routine does not turn the motor output off. To actually turn the motor output on, bit 5 of address 1 must be cleared to 0. To turn the motor output off, bit 5 of address 1 must be set to 1.

The only other difficulty is that bit 4 of address 1 is normally an input bit (coming from the record and play buttons on the Datasette). In order for the program to write to that bit to clear it, the corresponding bit in the Data Direction Register (DDR) at address 0 must be set to 1 so that bit 4 of address 1 will be an output.

Lines 40 through 60 take care of the preliminaries described in the previous two paragraphs. To understand this business of "setting" and "clearing" bits, we must pick up some background information.

The eight bits in the binary (base 2) representation of a byte are numbered left to right as 7 through 0. The most significant bit is the bit on the left. It has a place value of two to the seventh power (2 7) or 128. The least significant bit is the bit on the right. It has a place value of two to the zeroth (2 0) or 1. It is helpful to write the eight bits of a byte with a space between the 5th and 4th bits. Consequently the binary equivalent of the number 128 is %1000 000 where the "%" indicates that the value is in binary notation. Likewise %0000 0001 is the binary notation for the number 1.

When we say that a bit is "set" or "clear", we mean that it has a value of "1" or "0" respectively. In the value 128, bit 7 is set and all others are clear. Most bytes in memory are treated as single quantities. The individual bits within those quantities simply add up to make the resulting value.

On the other hand, each bit in the DDR byte at address 0 stands for something special. If a particular bit is set (to 1), that means the corresponding bit in the port at address 1 is an output bit. Conversely every clear bit in the DDR byte at address 0 corresponds to an input bit in the port at address 1.

What is a port? A port corresponds to physical pins on the microprocessor or its peripheral chips at which other physical devices (such as Datasette switches and motors) may be attached and monitored or controlled. The 8510 processor in the C-128 has seven Input/Output lines (P0 through P6) corresponding to bits 0 through 6 of address 1. The C-64 uses only bits 0 through 5.

On power up, bits 4 and 6 correspond to input lines and the others are output lines. The microprocessor changes the voltage levels of its output pins by writing to the port (POKE), and it determines the signal levels coming into the input pins by reading the port (PEEK). These input and output signal levels are either Set (high or logic 1) or Clear (low or logic 0).

BIT MANIPULATIONS

Generally we deal with bytes when using PEEK and POKE. How is it possible to set or clear a particular bit within a byte? We will use the Boolean operations AND, OR, and NOT. The basic rules are

1) To Set a bit, use an OR operation:
   a) 0 OR 1 is 1; 1 OR 1 is 1; therefore, ORing any bit with 1 will SET that bit to 1;
   b) 0 OR 0 is 0; 1 OR 0 is 1; therefore, ORing any bit with 0 leaves the bit unchanged.
2) To Clear a bit, use an AND operation:
   a) 0 AND 0 is 0; 1 AND 0 is 0; therefore ANDing any bit with 0 will CLEAR that bit to 0;
   b) 0 AND 1 is 0; 1 AND 1 is 1; therefore, ANDing any bit with 1 leaves the bit unchanged.

A quantity called a "bit-mask" or "mask" is used to specify which bits will be set or cleared. We must choose the mask so that only the bits to be changed are changed. The rules above also show how to choose mask bits so that the other bits in the byte are left unchanged.

Consider the mask needed to set only bit 4 of a byte. From rule 1a, bit 4 of the mask must be 1. So that the other bits of the byte are not affected, rule 1b tells us that the other bits of the mask must be 0. Consequently the mask to set bit 4 is %0001 0000. The decimal value of this mask is 2↑4 or 16. To set bit 4 of byte B, we simply perform the operation B OR 16.

In BASIC, type B=130 : PRINT B OR 16. The result is 146. Why? One way to see this is to write the binary representation of 130. This program will perform the conversion for any byte value from 0 to 255:

```
10 INPUT "DECIMAL BYTE";D
20 FOR N=1 TO 8
30 B$=STR$(D AND 1) + B$
40 D=D/2
50 NEXT N
60 PRINT "%":B$
```

The binary value of 130 is %1000 0010 (2↑7 + 2↑1). If we perform the bit-by-bit OR of this number with the mask %0001 0000, the only effect is that bit 4 of the original number becomes 1, giving a binary value of %1001 0010. This is 2↑7 + 2↑4 + 2↑1 or 146. Use the following program to convert binary strings (any length of 0's and 1's) into decimal to verify other results:

```
10 INPUT "BINARY VALUE";B$
20 FOR N=1 TO LEN(B$)
30 D=2*D + VAL(MID$(B$,N,1))
40 NEXT N
50 PRINT D
```

Now let's make a mask to clear bit 4 of a number. According to rule 2a above, bit 4 of the mask must be 0. By rule 2b, all other bits must be 1 so that only bit 4 will be changed. Therefore the mask to use is %1110 1111 which is 239 in decimal. To clear bit 4 of a quantity B, calculate B AND 239. For example, PRINT 146 AND 239 returns the original value 130. Why? Because bit 4 of 146 is cleared when 146 is ANDed with 239. (This is the same as subtracting 16 from 146.)

The clear mask is somewhat more obvious if we use the NOT operation. NOT gives the 1's complement of a number. All of the 0's in the binary value become 1's and all 1's become 0's. We can represent the mask %1110 1111 as NOT %0001 0000. Now we can clear bit 4 of byte B with the operation B AND NOT 2↑4.

This adds some symmetry to the entire process:

To Set bit B of value M, calculate M OR 2↑B.
To Clear bit B of value M, calculate M AND NOT 2↑B.

The functions defined in lines 20 and 30 of *LED Driver* read the current value in memory location M, then set or clear bit B of that value. Lines 40 and 50 show how these functions are used. You must use the variable M to represent the memory address.

DUTY FACTOR AND FREQUENCY

LEDs are often multiplexed. That means they are repeatedly turned on and off. This operation is repeated rapidly enough so that, to the eye, the LED appears continuously lit. *LED Driver* lets you interactively change the frequency at which the LED is turned on and off. At low frequencies, the flickering of the LED is very obvious. At high frequencies, your brain fuses the on/off cycles into a continuous image of brightness.

The brightness of the LED is affected by the duty factor with which it is multiplexed. A 50 percent duty factor means that the LED is on for the same amount of time that it is off. A 10 percent duty factor means that the LED is on for only one-tenth of each on/off cycle. Consequently it is off for the other nine-tenths of the cycle.

When a fixed amount of current flows through the LED, the LED's brightness depends upon the duty factor. Higher duty factors give brighter output. Lower duty factors give less brightness.

The same ideas apply to motors. If we apply fixed value voltage pulses to an electric motor, its speed depends on how "wide" the "on" pulses are with respect to the width of the "off" pulses. Thus the speed of the motor depends upon the duty factor of the applied voltage.

Run *LED Driver* to see the effects of frequency and duty factor on the LED. A bar graph generated by the routine at line 2000 shows the relative values of frequency and duty factor. Compare the bar graph with the actual appearance of the LED.

Instructions for changing the parameters are given in the remarks beginning at line 1000. Initially the duty factor is 50 percent. As you change the frequency of the on/off cycle with the + and − keys, the duty factor is unaffected. The LED can be rapidly blinking (high frequency) or slowly blinking (low frequency) while its duty factor remains at 50 percent. It is always on for the same amount of time that it is off.

The 0 key toggles the duty factor back and forth between 0 percent (always off) and 100 percent (always on). The

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other numeric keys provide intermediate values of duty factor from 10 to 90 percent. At a given frequency, the sum of the on and off times is constant. The duty factor determines the relative amounts of the on and off times.

The LED appears dimmer at lower duty factors than at higher duty factors. This is your brain's interpretation, however, since the LED's instantaneous brightness is always the same whenever it is on.

You may delete line 1130 to eliminate the bar graph. This will allow quicker transitions between frequency and duty factor changes made from the keyboard. Otherwise the LED blinks for a moment whenever the bar graph is changed.

LIGHT VIBRATIONS

Another way to see the effect of duty factor is to create what might be called a manual oscilloscope. Add line 99 GOTO 3000 and run the program. The effect will be best if you are in a darkened room. The routine at line 3000 alternates between a 90 percent and a 10 percent duty factor. If you rapidly move the LED back and forth about six inches or so, you will see wide bands of light separated by narrow dark bands for a moment. Then you will see wide dark bands separated by narrow light bands.

As you move the LED, you are creating a "position as a function of time" graph of the light. If the LED is on most of the time in traveling from point A to point B, you will see a wide streak of light. If the LED comes on only briefly in the journey from point A to point B, you will see a narrow streak.

Perhaps you have seen a toy based upon this principle. The toy consists of a wand with a row of LEDs on it. The wand is rapidly moved back and forth. The LEDs are turned on and off at certain times during the movement of the wand. The brain is able to convert these regions of light and dark into an image somewhat analogous to the dot-matrix image of characters on paper. With the single LED you might be able to create a Morse-code sequence of dots and dashes.

FROM LIGHT TO SOUND

Your eye and brain are not capable of seeing on/off frequencies much greater than 20 or 30 cycles per second. Surprisingly enough (or is it?), those frequencies are at the low end of the range where your ear begins to be functional.

To move into the sonic domain, replace the LED with a loudspeaker. But first, another word of caution: the loudspeaker has a magnet on it. Tapes and disks don't appreciate magnets at all. So be careful where you put the loudspeaker.

Alternating high and low voltages don't actually turn a loudspeaker on and off. Instead they cause its cone to vibrate back and forth. If you apply a constant voltage to the speaker, its cone will either leap forward or backward and stay there.

If you remove the voltage, the cone will return to its initial position because of the springiness of the cone's mounting. Actually the cone will go on past its starting position because of its momentum. It will then vibrate around the starting position until finally coming to rest there.

When the cone moves forward, it pushes and compresses the air ahead of it. As it moves backward, it pulls and rarefies the air in front of it. These variations of the air density (if they are frequent enough) are detected by the ear as sound. The faster the cone vibrates, the higher the pitch of sound you hear.

As you run *LED Driver* with a speaker instead of an LED, change the frequency and observe the speaker cone if you can. Unfortunately the small speaker mentioned in the parts list above doesn't move enough to be readily observed. Use an eight inch or larger woofer to really "see" the sound. Changing the duty factor when driving the speaker will affect the quality of the sound.

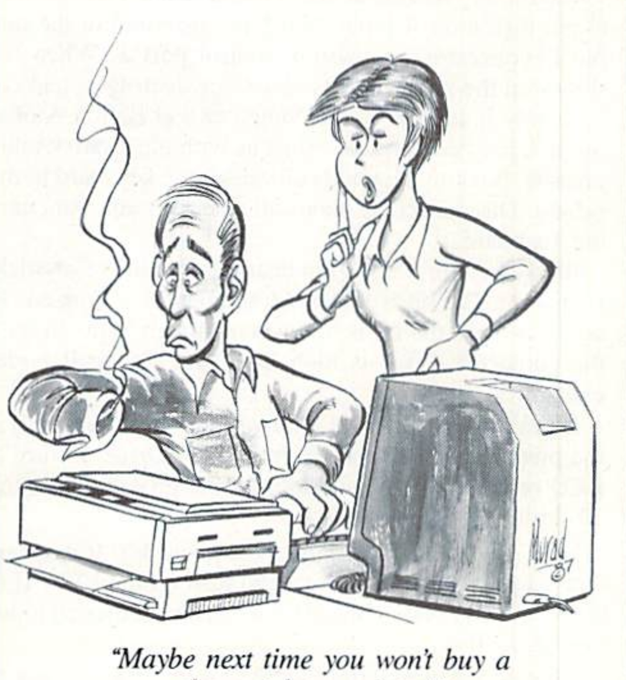
FASTER SPEEDS

Many "real" microcomputer control applications require the high speed of machine language. The machine language program *LED.MON* on page 89 uses the same hardware we used for the *LED Driver* program. Its main purpose is to show how some of the functions of the BASIC program can be duplicated in machine language. The commented monitor listing should be self-explanatory with some study.

Locations $1400 (hexadecimal) and $1401 store values for the "on" time and the "off" time of the LED. These values are used as loop counters in the Pause subroutine beginning at $143A. The program begins at $1402. The main loop is repeated until any key is pressed. The GETIN Kernal routine is used at $1431 to see if any key is pressed. Notice how bits are set and cleared in machine language.

The LED is turned on and off at a fixed frequency (much faster than the eye can see). Its duty factor is repeatedly decreased, causing the LED to become gradually dimmer, until it reaches a minimum. Then the duty factor is returned to its maximum value, and the process is repeated.

A pause value of 0 gives the longest delay, corresponding to 256 times through the Pause loop. A value of 1 gives the shortest delay, just once through the Pause loop.



"Maybe next time you won't buy a closeout laser printer!"

Keep in mind as you watch the LED that we are not decreasing the amount of voltage applied to it, just the proportion of time during which the voltage is turned on.

You may enter this program with a monitor or an assembler. In the C-128 monitor, use the A command to assemble the instructions in the right-hand column of the listing (skip all comments). Start at $1402 as follows:

```
A 1402 LDA $00 (RETURN)
ORA #%00010000 (RETURN)
STA $00        (RETURN)
```

and so forth. The monitor supplies all addresses except the first. Don't put the space between the binary digits shown in the listing. The monitor converts the binary digits to hexadecimal, so you can enter them in hex if you prefer. The initial values in $1400 and $1401 can be entered with the M command.

When you are done entering the program, save it with S"LED.OBJ",8,1400,143E. From the monitor, start the program with J F1402 to use bank 15 for the Kernal routine. From BASIC, you may reload and execute the program with BLOAD"LED.OBJ" (or LOAD"LED.OBJ",8,1 on the C-64), then SYS 5122.

If you prefer, run the BASIC program LED.BAS on page 90. This program puts the machine language data into memory and executes the program with SYS 5122. Again, pressing any key stops the program. SYS 5122 restarts it.

The machine language speed allows you to hear more easily the effect of duty factor on tone quality. Replace the LED with a speaker as before. The frequency of the tone is constant, but its duty factor is changing.

OPTICAL OSCILLATION

One final activity shows a very simple example of a "closed loop" control system. Connect the CdS photocell to pin 6 (Button A input) and pin 8 (ground) of the nine-pin D connector for joystick control port 2. When light shines on the photocell, its resistance decreases, and consequently it appears to the computer that Button A of the joystick has been pressed. (Just as with the joystick button pressed, light on the photocell causes the keyboard to misbehave. Disconnect the photocell whenever you want to use the keyboard.)

Bit 4 of address 56320 indicates the status of joystick 2 Button A. The bit is low when the button is pressed. For our purposes, the bit is low when enough light shines on the photocell. Bit 4 is high when the photocell is dark enough.

Lines 20 through 60 of *Optical Oscillator* (page 90) are the preparatory instructions from *LED Driver* to turn the LED on or off. The main loop of the program is in lines 70 through 90.

Line 70 looks at the status of the photocell. If it is dark, then L1 is written to address 1 to turn on the LED. If the photocell is lit, L0 in line 80 is written to address 0 to turn the LED off.

How do we make an oscillator? Very simply. Place the LED close to the photocell, and point it directly at the photocell. Adjust the room lighting so that the photocell is dark (PEEK(56320) AND 16 is 16). Then run the program. Line 70 sees a dark photocell, so it turns on the LED. The LED shines on the photocell. Line 80 sees a well-lit photocell, so it turns off the light. Line 90 creates the "ad infinitum."

You can adjust the relative positions of the photocell and the LED to make the system very sensitive to even the slightest change in ambient light. By waving my hand in front of a lamp across the room, I was able to start and stop the oscillations. If the photocell doesn't get dark enough, the LED will never be turned on. If so, you may have to close the curtains or turn out some lights. If there is not enough light on the photocell even with the LED lit, turn on another room light.

Keep in mind that we are controlling one device (the LED) based upon the input we are receiving from another device (the photocell). In essence we are using a one-bit analog-to-digital converter (the joystick button input) and a one-bit digital-to-analog converter (the LED output). The photocell is either illuminated or dark. The LED is either on or off.

For further experimentation, you might bring the photocell into the higher resolution (8-bit) analog-to-digital paddle input of the joystick port just as we did in a previous *Rupert Report*. Use that input to control the duty factor of the LED so that a constant amount of light shines on the photocell regardless of the ambient light.

We have hardly scratched the surface of microcomputer control systems. There is a limitless variety of transducers (thermocouples, pressure detectors, tachometers, and so on) for monitoring the environment, and many types of control devices (relays, motors, speakers, among others) for changing the environment. An LED and a photocell are just the beginning. Enjoy your experimentation. We will see other control applications in the months ahead. ☐

SEE PROGRAM LISTINGS ON PAGE 88

A C-64 BIT MAP GRAPHICS TUTORIAL

By Morton Kevelson

Visual gratification plays an important part in the success of the C-64. The VIC II chip, which is responsible for the 64's display, can generate images in 16 colors in a variety of character and bit mapped graphic displays. In addition, the chip hardware supports sprites which can be moved about independently from the background display.

Without question it is the two bit mapped display modes which offer the greatest opportunity for artistic expression on the C-64. This comes as no surprise, as the bit map display provides the greatest detail and the most color flexibility of all the C-64's display modes.

The VIC II chip's two bit map display modes differ in both resolution and color flexibility. The high resolution bit mapped display offers the greatest possible detail, as an image is composed of 64,000 pixels (picture elements or dots) in a 320 by 200 array. The multicolor bit mapped display, which consists of 32,000 pixels in a 160 by 200 array, gives up half of the horizontal detail in exchange for greater color flexibility.

Either format is capable of satisfying results. As the proprietor of the *Ahoy! Art Gallery* I have seen many quality images in both formats. I've also found that considerable confusion exists among C-64 users as to the capabilities and limitations of each format. Additionally, I've received numerous requests for the same images in both formats. Although it is possible to convert an image from one format to the other, there are certain limitations which the user should be aware of.

To clarify the issues I decided that the C-64's display would provide the best means of illustrating the key differences. The program which accompanies this article (see page 95) is designed to let you experiment with both the high-resolution and multicolor displays. In particular it will fill a small portion of the bit map with a selected bit pattern. It then permits you to quickly change between high resolution and multicolor mode. The pattern colors may also be readily varied.

When performing the suggested experiments keep in mind that the display monitor will play an important role in what you see. By necessity, the tutorial requires a display pattern which varies adjacent pixels. Not all monitors have the ability to resolve adjacent pixels in the high resolution display. This is most likely true when a television is used as the display device. I tried out the patterns on the 1702, 1902A, and Amiga 1080 monitors. The visual results were different on each one. However, in spite of these limitations in screen resolution, it is still possible to detect the difference between the display modes.

THE PROGRAM

The program is written for the C-64 or the C-128 in C-64 mode. As such it uses a series of POKEs to set the display values in the bit map. It is possible to write an equivalent program in BASIC 7.0 which would not require any POKE commands. Owners of the C-128 may wish to do this to

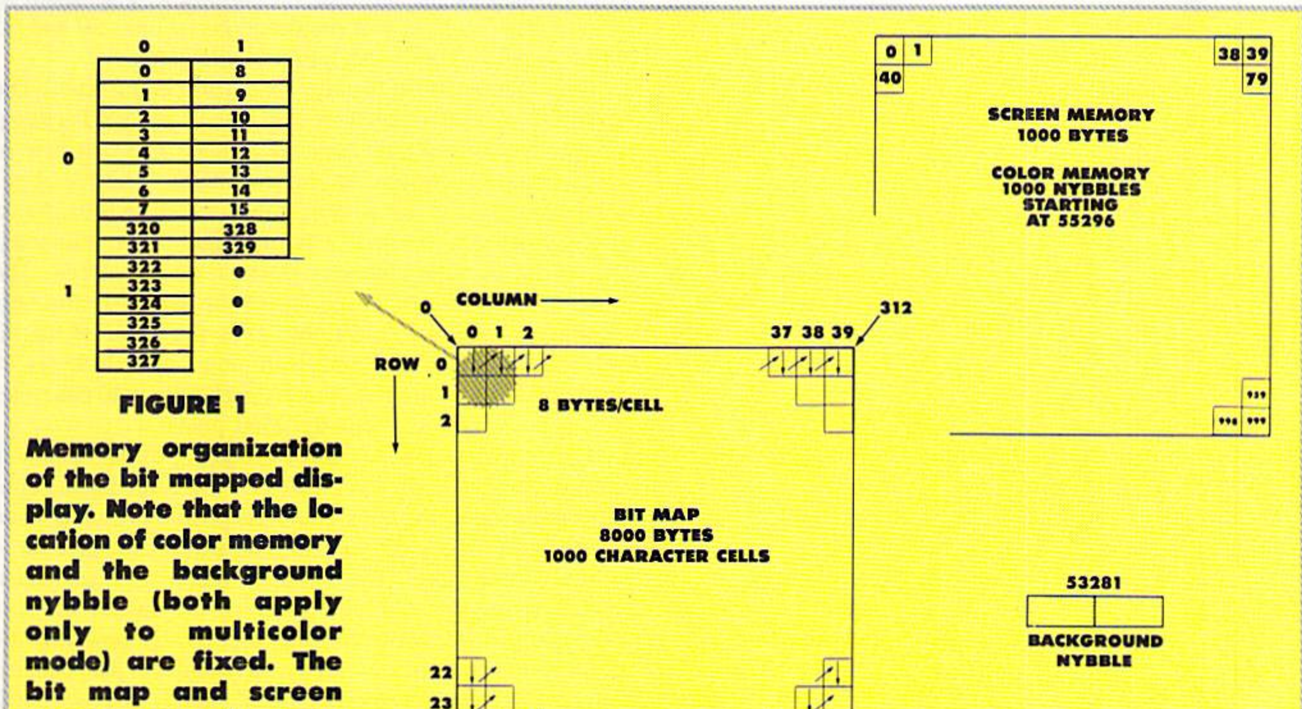


FIGURE 1

Memory organization of the bit mapped display. Note that the location of color memory and the background nybble (both apply only to multicolor mode) are fixed. The bit map and screen memory can be anywhere in the C-64's RAM space.

prove that the bit map display modes are truly identical.

The VIC II chip can only "see" 16 kilobytes at one time. That is, only a 16K block of RAM, out of the available 64K, may be addressed by the VIC II at one time. Simple math tells us that there are four 16K video banks available to the VIC II. Video bank selection is controlled by Data Port A of CIA #2 in the C-64. Specifically, bits 0 and 1 select the bank. Line 10 sets the Data Port for output. Line 20 selects the actual bank. The value of variable A in line 15 is taken from the following table:

Value of A	Bank No.	Address Range
3	0	0-16383 ($0000-$3FFF)
2	1	16384-32767 ($4000-$7FFF)
1	2	32768-49151 ($8000-$BFFF)
0	3	49152-65535 ($C000-$FFFF)

You will notice that I chose Bank No. 3 for this tutorial. This section of memory is completely isolated from BASIC, so we won't have to change any pointers to "protect" it. The disadvantage is that its top 8K also lies under the Kernal ROM, which prevents BASIC from PEEKing the values there. The 4K block beginning at $D000 is also shared by the C-64's I/O chips and the color RAM. This will not present any problems for this tutorial.

The bit mapped mode is activated by bit number 5 in the VIC II register at 53265 ($D011). This bit may be set by ORing the contents of 53265 with 32 in line 30. The use of PEEK in conjunction with the logical OR function allows us to set bit 5 without affecting, or even knowing, the status of the other seven bits in the byte.

The next step is to set the location of the bit map data within the 16K block. Since the bit map requires exactly 8000 bytes, there is room for only two bit maps in a 16K block. Once again a single bit is responsible for locating the bit map. In this case it is bit number 3 of location 53272. Setting this bit, in line 50, causes the bit map offset to be 8K.

The high-resolution bit map display actually consists of two parts. The second part of the display, which is only 1000 bytes, contains the color data. I will refer to this part of the display as screen RAM. The reason for this nomenclature is that in character display mode this block holds the pointers to the C-64's character patterns in ROM. Each byte of screen RAM actually contains the data for two colors. This leaves four bits per color, which allows for 16 possible colors. Since there are only 1000 bytes of screen RAM, the VIC II chip uses each byte to set the color of eight bytes in the bit map.

As you might expect, there are 16 possible positions for the screen RAM in a 16K block. Since the bit map already occupies eight, our choice is narrowed down. We will also avoid the 4K I/O block starting at 53248 ($D000). This leaves four possible choices starting at 49152 ($C000). I chose the first 1000 bytes. You may wish to fill the other three blocks with different color data. This would permit you to change the appearance of the entire display by changing the contents of a single byte–something which can be done very quickly even with BASIC. The screen RAM offset is controlled by the top four bits of 53272. I set them to zero in line 60. Note that the functions of lines 50 and 60 can be readily combined into a single step.

The organization of the bit map merits careful study. The screen position at which a bit map byte is displayed is based on the structure of the character display. The first byte of the bit map is displayed as a horizontal strip in the upper left hand corner of the screen. The second byte is displayed directly beneath the first. The first eight bytes, numbered 0 to 7, fill the first character position on the screen. The next eight bytes start at the top of the screen in the next character position to the right. Thus the order of the bit map zigzags across the screen in jumps of eight bytes. A total of 320 bytes are required for each row of 40 character positions, which are actually 2560 pixels.

The correspondence of screen memory to the display is a bit more organized. Each byte sets the color for the contents of the corresponding character position running from left to right across the screen. The entire arrangement is illustrated in Figure 1. You may also observe the organization of the bit map by carefully watching the display the first time you run the accompanying program. On power up the C-64's memory is filled with a nearly uniform data pattern. This will be visible as soon as the bit map mode is activated. Lines 110 to 140 fill the color memory with the default colors. You will be able to see the screen being scanned one character position at a time. Lines 160 to 180 clear the bit map. If you watch closely you will see each byte being

cleared. The process can be slowed up by inserting a delay loop at line 175. The total clearing process for 9000 bytes in BASIC takes about one minute.

The multicolor bit mapped display also uses the 8000 byte bit map and the 1000 byte screen RAM. There are 1000 nybbles of additional color data associated with the display. This data is always located in the 1K block starting at 55296 ($D800). The lower nybble of 53281 ($D021) contains a value which may be considered to be the background color for the entire screen.

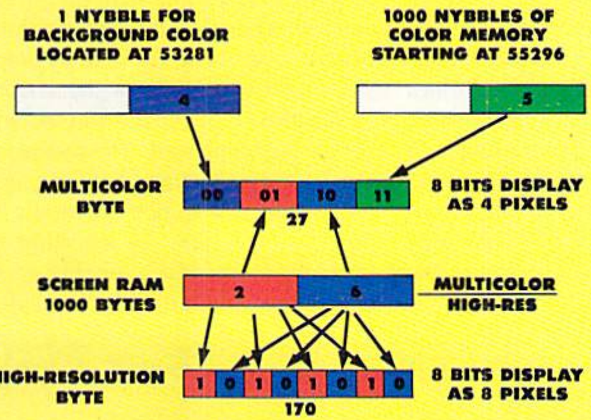


FIGURE 2

Where the bit mapped display gets its color information. Numbers in the color registers are the actual color values. Bit map bytes are in binary with values in decimal below.

The assignment of screen colors is mildly complex. Figure 2 illustrates the arrangement. In high-resolution mode each bit acts as a pointer to a nybble in screen memory. A zero bit gets its color from the lower nybble. A one bit looks at the high nybble. Every eight bytes (64 pixels) of bit map is assigned to a single unique byte of screen RAM. Thus only two colors are allowed in a single character cell (8 by 8 pixels). However, each character cell can have any combination of two colors out of the available 16.

In multicolor bit mapped mode each pair of bits acts as a pointer to a color nybble, as per the following table:

Bit Pair	Color Nybble
00	Background Color in 53281
01	High Nybble Screen RAM
10	Low Nybble Screen RAM
11	Nybble in Color Memory

As you can see, the multicolor display permits up to four colors in each cell. Three of these colors may be uniquely defined for each cell, while the fourth color is the common background color. Thus multicolor bit map mode offers additional color flexibility at the expense of resolution. Observe that although character cells still occupy the same display area, they are only 4 pixels wide in multicolor mode.

The program illustrates the operation of the bit map modes by filling a small section of the screen with a predefined pattern. If you wish to change the size and location of the test pattern, simply change the variables in lines 190-210. Just make sure that R1 is less than R2 and C1 is less than C2.

The actual fill patterns are stored in line 235. I have provided six patterns as shown in the next table. Feel free to change these values to observe different effects. If you change the number of patterns, be sure also to change variable CN in line 240.

Fill Patterns

Value	Bit Pattern
102	01100110
68	01000100
85	01010101
170	10101010
204	11001100
99	01100011

The patterns I have chosen are far from arbitrary. Value 102 will look the same in high-resolution and multicolor. The pattern will appear to shift one pixel to the left and the lines will double in width when you switch modes. Value 68 will change one of its colors as you switch. Value 85 will disappear entirely when you go to multicolor while value 170 will appear all black. Both 85 and 170 will appear as alternating pixel-wide strips in high-resolution. Patterns 204 and 99 will appear identical in both modes except for color changes.

The program is controlled entirely by the function keys, as per the following chart:

f1	Switch to high-resolution mode
f3	Switch to multicolor mode
f5	Change to next pattern
f7	Quit
f2	Change color of screen hi-nybble
f4	Change color of screen lo-nybble
f6	Change color of color memory
f8	Change background nybble

The first time you run the program use f1 and f3 to switch between high resolution and multicolor modes while changing patterns with f5 and observe the effects. After you have become familiar with the results, try changing the colors. This will also give you an idea of which color combinations give the best resolution on your monitor. Note that all functions will recycle through the available values. ☐

Suggested Additional Experiments

1. Change the bit patterns on line 235 and note the effects.

2. Create four 1K screen memory blocks in the $C000 area. Find a bit pattern which results in a strikingly different image as the screen memory blocks are swapped. Use line 60 to swap screen memory.

3. Set up an alternate bit map in the $8000 block (VIC Bank 2). Swap between the two. Remember to protect this block from BASIC by changing the appropriate pointers.

ENTER, THE ELECTRONIC DRAGON

Make Your 64 an Arena of Martial Arts Death!

By Arnie Katz & Bill Kunkel

Widespread awareness of Oriental martial arts has come to Western Civilization in less than a single generation. It started with a television series called "Kung Fu," achieved mass recognition as a result of the films of Bruce Lee and his numerous imitators, and has now become a popular theme in every medium including computer software.

The first martial arts games for the computer were, of course, based on the Occidental discipline of pugilism. The illegitimate offspring of the Grecian approach to self defense, professional wrestling, has inspired several coin-operated and home computer games.

It took overwhelming acceptance for two venturesome designs, *Bruce Lee* (Datasoft) and *Karate Champ* (Data East), to bring on the golden age of computerized combat. The former introduced the idea of a martial arts adventure. The latter, a coin-op translated for the C-64 last year, created a joystick-activated control system which numerous subsequent home computer entries have imitated.

Fist: The Legend Continues (Mindscape) is the sequel to 1986's well-received *Way of the Exploding Fist* (Spinnaker). The new title from Melbourne House uses a similar joystick- actuated combat system, but it places the hand-to-hand fighting within the overall context of an adventure.

Centuries after the proud tournaments depicted in *Way of the Exploding Fist*, the secrets of the skilled warriors are all but forgotten. Reeling under the tyranny of the Warlord, the land waits for a reincarnation of an exploding fist master to defeat their enemies and restore freedom.

The player becomes a young disciple who must wander across the dangerous landscape in search of scrolls of ancient wisdom. The terrain is as challenging as it is varied. The lone fighter must climb mountains, ford rivers, and navigate labyrinthine underground caves. Fortress cities on the cliffs must be explored, as well as the catacombs beneath.

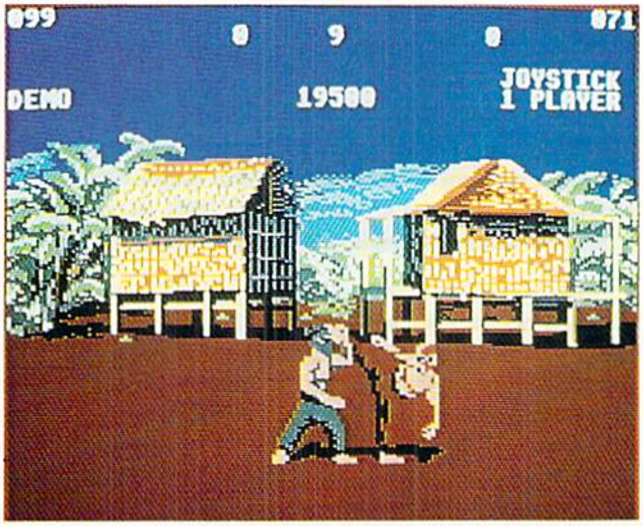
The disciple becomes more skilled and powerful as a result of adventurous experiences. When the player finds enough scrolls and meditates at shrines to unlock their power, the unspeakable terrors of the Warlord's own stronghold beckon the stouthearted.

The scroll in the lower left hand corner of the screen lengthens and shortens in response to fluctuations in the onscreen adventurer's "Chi" (energy). A hero loses Chi through battle, intense physical exertion, and the effects of poison. Normal rest and meditation at one of the secret shrines restores Chi.

The scrolls which the adventurer collects are more than window dressing. Every scroll bears a symbol called a trigram, each of which symbolizes a different power. A trigram appears on the altar of each shrine. If the visitor to the holy place owns the scroll with the identical symbol, meditation endows the fighter with the corresponding power.

It wouldn't be a martial arts game without plenty of fighting, and *Fist: The Legend Continues* delivers a satisfying array of opponents. Sneaky ninjas, powerful Shogun warriors, and stealthy assassins are only three of the many types of foes found in this perilous realm.

Fortunately, a great variety of kung fu moves is possible with the joystick control scheme. The documentation card included with the disk includes a schematic which shows the effect of each move of the stick, with or without the button pressed. The disciple can also block by backing away just as the foe strikes, and launch the mystic "exploding fist" blow by kneeling and punching at the same time. Players can enter moves with the keyboard if desired, but the joystick is the more satisfactory method.



Fist: The Legend Continues ***incorporates a great variety of kung fu moves, plus a sizable array of opponents including ninjas, Shogun warriors, and assorted deadly assassins.*** ***READER SERVICE NO. 269***

The Training mode, which the computerist can select from a screen which appears after the program has loaded, gives the gamer a chance to practice before venturing into the violent, cruel world of the adventure. It also provides for head-to-head play against a human-directed foe.

Art and music, though more or less typical for martial arts fighting contests, are both pretty good. The diversity and detail of the backgrounds, in particular, is quite laudable. The figures are well-animated and respond quickly to joystick or keyboard command. But the most attractive feature of *Fist: The Legend Continues* is the action-adventure element. Electronic martial arts

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fighting is generally exciting fun, but this program's intriguing storyline enhances its entertainment value.

England's Melbourne House is also responsible for *Kung Fu II: Sticks of Death.* Although it was published in the U.K. in late 1985, it has only just reached U.S. shores under the aegis of UXB, one of the Spinnaker family of brands.

This solitaire contest is a mixture of innovation and imitation. Its best feature is that, unlike most other martial arts titles, it focuses on Oriental staff fighting instead of barehanded combat.

On the negative side is the humdrum plot. Surely, there is a princess somewhere who has not been captured by the evil ninja and imprisoned in his castle guarded by a legion of fighters.

Some computerists despair of memorizing the complicated command-entry systems found in other martial arts games. By contrast, this one is easy and straightforward.

With the button in the "up" position, the stick causes the fighter to move forward or back, duck, or jump. When the computerist presses the button, moving the joystick right jabs the staff into the opponent's midsection, pushing it up orders a smash to the head, and pulling it down slashes at the ankles. Battles are mostly offense versus offense, with little chance to block or evade blows.

A foe vanquished by the kung fu master turns into an ornate urn. Striking the urn with the staff either reincarnates the antagonist or opens a hidden passage for the hero.

The artwork is only fair. The figures are large, but they could have been drawn more slickly. The music, on the other hand, is outstanding. The Oriental-sounding basic melody is embellished with numerous changes of pitch and trilling flourishes.

Kung Fu II: Sticks of Death is billed as "the most violent karate game available." That's probably an exaggeration, but there's no denying that it is fast and exciting enough to please almost any action game lover.

Martial Arts Adventures

Moebius (Origin Systems) virtually reverses the format found in the action adventure titles already discussed. It features martial arts combat as interludes between stretches of more orthodox adventuring.

Moebius blends a play-mechanic reminiscent of Lord British's Ultima series (Origin) with three different action interludes: karate, sword-fighting, and divination.

Fists and blades aren't the only weapons in the struggle to remove the yoke of tyranny which the renegade disciple Kaimen has placed upon Khantun. The player starts the game with three shuriken, a gift from Yan Chun the Zen Master. The throwing blades are an excellent ranged weapon, ideal for smiting enemies from afar. On the journey through the realms of Earth, Water, Air, and Fire in search of the Orb of Celestial Harmony, the player also acquires various sorts of magic. Additional power and wealth is found in the many chests and vials which the player can pick up during his travels.

Programs Covered in this Article

MOEBIUS ($50.00)
Origin Systems, 340 Harvey Road, Manchester, NH 03103 (phone: 603-644-3360).

UCHI MATA ($29.95)
FIST: THE LEGEND CONTINUES ($29.95)
Mindscape, 3444 Dundee Road, Northbrook, IL 60062 (phone: 312-480-7667).

KUNG FU II: STICKS OF DEATH ($19.95)
Spinnaker, One Kendall Square, Cambridge, MA 02139 (phone: 617-494-1200).

Divination is much more subtle, but it's quite useful. It permits the player to discover the nature of artifacts found during the quest.

The plot of *Moebius* is a multistage quest. In each of the four realms, the electronic adventurer must liberate the Monks of Moebius the Windwalker and return them to their holy places. When this considerable feat has been accomplished in all lands, the quester may take the fourfold path and confront Kaimen himself.

The player must undergo training to master the three action sequences prior to embarking upon the adventure. For swordplay and bare-handed combat, this consists of mastering the streamlined keyboard order-entry system well enough to beat one computer-controlled opponent. Successful divination requires the player to solve an action-oriented puzzle.

The three-dimensional perspective graphics used in non-combat situations are very good, but the combat visuals are much more striking. Two sizable, beautifully intricate figures face each other in an otherwise bare arena. Each keystroke produces well-articulated movement, and the fighters' reactions to blows are lifelike and realistic.

As with so many Origin products, the trimmings in *Moebius* are first-rate. Besides the clever rulebook and accompanying reference card, the buyer gets a poster and a kung fu head band in the package. Atmospheric full-screen drawings make waits during disk access almost pleasant.

Moebius presents a coherent fantasy world as the backdrop for plenty of martial arts mayhem. Designer Greg Malone has brought forth a classic.

A Different Twist

Brian Jacks' *Uchi Mata* (Mindscape), designed by Andy Walker and Paul Hodgson, is a refreshing respite from the current bombardment of karate simulations. It's the first attempt to translate judo to the computer.

The practitioner of karate uses force against force. The master of this martial art selects the weakest point on his target and strikes with maximum, concentrated force.

Judo, on the other hand, is a defensive discipline based on the idea that the force of one's attacker can be turned against him. Karate is all kicks and punches; judo is trips and throws. The exotic forms of martial artistry seen in Saturday afternoon chop-sockey flicks combine these two forms to various degrees, along with trampoline leaps and high-decibel sound effects.

Uchi Mata pursues authenticity every step of the way, right down to signing the 7th Dan black belt Brian Jacks as a technical advisor and front man. The user can face off against the computer or another human player, or en-

gage in a practice session in which the opponent just stands there and lets the user try moves against him. The practice mode is altogether necessary since *Uchi Mata* is complex to learn and play.

Color-coded bar graphs in the upper left hand corner of the main display measure each fighter's grip and stamina. Flanking a clock at the top center of the screen are "attack indicators," which light for each combatant when his grip and stamina are sufficient to execute a move. A window in the upper right hand corner alternately displays the foot positions of the fighters (during combat) and a referee (at the beginning and end of each match).

The arena fills the bulk of the screen. Scores, both point totals (for the vanity board) and match totals appear beneath the clock. The name of a successfully executed move appears at the bottom of the screen.

The golden rule is that the player must be sure to get a good grip on his adversary. The computerist must hit the action button promptly once within range of the rival and then check the grip indicator. Next, stamina must reach a prerequisite level so that the attack indicator lights. The fighter can then execute one of the four moves discussed in the documentation or a maneuver of his or her own design.

Unfortunately for a game so dependent on solid instructions, *Uchi Mata* suffers the typical Mindscape curse of weak documentation. Nowhere, for example, is there a reproduction of the play screen with call-outs for the many meters and indicators. The instructions promise that there are, in fact, more than four possible maneuvers, but the selection process is so complicated that it's difficult to memorize even the provided examples.

Here, from the instructions, is a description of how to do the titular "Uchi Mata" throw:

"Start with the joystick in its center position. In one continuous motion, press and hold the fire button, push the joystick to the left or right in the same direction that your player faces, rotate the joystick through the down (if left-facing) or up (if right-facing) position, and continue to rotate the joystick to the right or left in the opposite direction that your player faces. Then push



Moebius' *plot is a multistage quest. In each of the four realms, the adventurer must liberate the Monks of Moebius the Windwalker and return the holy men to their holy places. READER SERVICE NO. 271*

the joystick across its center position all the way to the left or right in the direction that your player faces."

In other words, not only must these sequences be learned, they must be learned twice, since the combatant's facing is crucial.

There are other moves the player may discover which are illegal and call for immediate disqualification. Although the instructions mention the existence of such holds, none are listed or described. The user must "stumble" upon them, so to speak, in the search for the mystery holds which the rulebook mentions so tantalizingly.



Uchi Mata: *thoughtful judo contest. READER SERVICE NO. 271*

The graphics are very nice, and the program's 400 frames certainly provide plenty of visual variety. The art and animation compare favorably with even the best karate programs.

The game's major problem other than weak documentation is that it makes the user monitor too many indicators and gauges. Many will find it almost impossible to check the stamina, grip, foot position, and attack indicators while executing a maneuver.

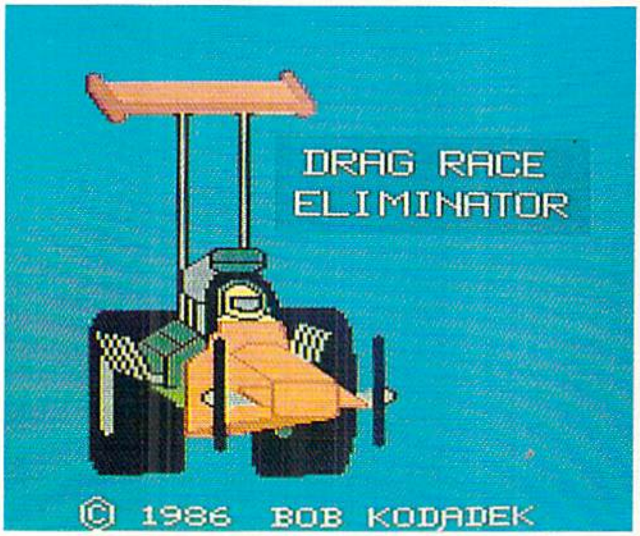
Uchi Mata represents a sincere, well-crafted attempt to reproduce a form of combat that is much less direct than karate or boxing.

Fists of the Future

By the time this article sees print, at least two more martial arts games will be available for the C-64. It is safe to predict they will be only two of many such titles published over the next year.

The current trend is away from "combat arena" showdowns toward designs which weave the fighting into more varied plot and action. It's also likely that many of the new titles will simulate something other than empty-handed karate or kung fu fighting.

But there's one prediction which doesn't require attaining Zen mastery: Those who enjoy fast-paced action contests with plenty of martial arts should continue to look to the East, and to their Commodore 64/128 computers! □



At the end of every contest, **Drag Race Eliminator** *reports on the driver's reaction time, high speed during the run, and elapsed time. Five classes of automobiles are available.* *READER SERVICE NO. 270*

DRAG RACE ELIMINATOR
Family Software
Commodore 64/128
Disk; $24.95

Representing the first time since Activision's videogame for the Atari 2600 that drag racing has crossed the finish line to the home computer screen, *Drag Race Eliminator* is an exercise in precise reactions and stubborn determination.

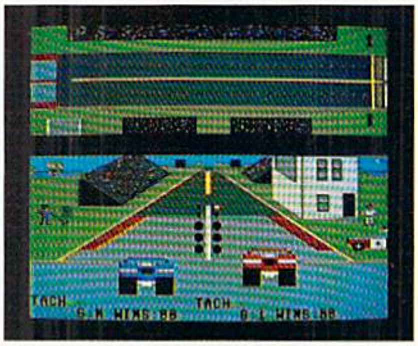
There are several choices to be made before the cars get to the starting line. It is best for new dragsters to first practice solo. Then technique can be further honed against a computer opponent. Finally, a human foe can be brought to the line for some competitive quarter-mile challenges.

There are five classes of automobiles available. The first two are top fuel dragster and top fuel funny car, both with two-speed transmissions. Fewer gear shifts translate into an easier car to pilot. The next two classes are top alky dragster and top alky funny car, with three speeds each. The greatest challenge comes from the pro stock category, where five gears are the norm.

Once those choices are made, the first screen presents a view at car level, just behind the Christmas tree starting lights. There are five lights in each row to convey different information. The top light tells the driver he's getting near the starting line. The second light means the car is staged, or ready to race. The race can't begin until both cars are staged. It's a stratetic advantage, in most races, to stage last. The computer will always wait for you to stage, but you can trick a human opponent into staging first by making short, sharp movements toward the line.

When both cars are staged, the third light tells the drivers the race is about to start, and .4 seconds later the fourth light sends the cars on their way. The fifth light is red, and only comes on if one car jumps the line too early.

During staging, the joystick disengages the clutch and applies the brakes. After staging is completed, the joystick shifts gears. Pushing the stick forward and releasing it selects the next available gear. The button is the accelerator.



A prestaged computer opponent waits for the player to complete the process.

There is an RPM bar at the bottom of the screen that is equivalent to a car's tachometer. To get optimum performance out of the vehicle, gear shifts should be done as that bar moves into the red. Stay in the red too long without shifting and the engine will be a black spot on the road.

The race starts when the green goes on, and the perspective shifts to an overhead view of both lanes. Since there's no steering to the game, this works fine. From the overhead view, it's possible to tell where the cars are in relation to each other and to the finish line. Just before the cars cross the line, parachutes come out and stop the racers. The overhead view is certainly utilitarian, but it might have been nice to have an option of seeing what the world looks like from the driver's seat, hurtling down the asphalt at over 200 miles per hour.

After each race, the program provides three important pieces of information. The first is reaction time. That figure represents the time it took from the lighting of the ready light, to the glow of the green. Perfect time is .4 second, and any lower figure indicates a foul. Anything higher than .9 second is extremely slow and won't even be registered.

The second piece of data is elapsed time. This reveals how quickly the car covered the quarter-mile distance. The ET clock doesn't start until the car moves. It's possible to have the best ET and still lose the race if the reaction time was too slow. After all, it's the first car across the finish line that wins.

The third figure is speed attained in the run. Breaking the current national records gets the time and name of the driver saved to disk.

Drag Race Eliminator is well-executed and gives a good feel for the drags, but there is one major complaint. There's no selectable level for the computer opponent. It won't be unusual for the gamer to lose 20-0 while practicing. The computer foe isn't perfect all the time; its performance is random. But it'll never blow an engine or leave the line too early, and a .9 reaction time is out of the question. Instead of using the computer opponent to prepare for human competition, the reverse will probably be true for most players.

Graphically, the game is pleasant to watch, but not an award-winner. Functional would be the most fitting term for the display. However, as an outing into an area totally devoid of competition, *Drag Race Eliminator* should draw a lot of interest among fans of the National Hot Rod Association.

Family Software, 3164 Surrey Lane, Ashton, PA 19814 (phone: 215-497-5561). *—Rick Teverbaugh*

TIPS AHOY!

Compiled by Michael R. Davila

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C-128 TAMPERPROOF INPUT

If you C-128 users liked the C-64 input routine ditty that was published in the January '86 *Ahoy!*, you probably wanted a version for your computer. The BASIC program below only accepts alphanumeric characters, upper and lower case. Incredibly enough, you can also include imbedded quotation marks without the input routine going into quote mode, or even insert commas and characters that otherwise crash the ROM input routine. Just print out your prompt with a ";" to inhibit a carriage routine, then set the number of characters desired in the variable A, and GOSUB 1000. The program clears the remaining part of the line it is on before proceeding. The input is returned in the string IN$ after hitting RETURN. The DELETE key is the only control character allowed, to backspace over mistakes. I know you'll enjoy using this routine for database systems and utilities. It should really come in handy when used in conjunction with C-128 windows! —Cleve Blakemore
Richmond, VA

```
·980 PRINTCHR$(14)CHR$(11):A=10:GOSUB1000
:PRINTIN$:END
·990 REM C128 TAMPERPROOF INPUT SUBROUTIN
E
·1000 PRINTCHR$(27);"Q";:IN$=""
·1010 POKE208,.:POKE244,1
·1020 GETZ$:Z=ASC(Z$):IFZ=.OR(Z>95ANDZ<19
3)ORZ>218THENPOKE244,.:PRINTCHR$(18)CHR$
(32)CHR$(157)CHR$(146);:POKE244,1:GOTO10
20
·1030 ZL=LEN(IN$):IFZL=ATHEN1050
·1040 IFZ>31THENIN$=IN$+Z$:PRINTZ$;CHR$(2
7)"Q";:GOTO1020
·1050 IFZ=13ANDZLTHENPOKE204,1:PRINT" ":R
ETURN
·1060 IFZ=20ANDZLTHENIN$=LEFT$(IN$,ZL-1):
POKE244,.:PRINTCHR$(32)CHR$(157)CHR$(157
)CHR$(32)CHR$(157);:POKE244,1
·1070 GOTO1020
```

C-128 HI-RES SHRINK

Many of you out there just love to experiment with graphics. Especially since the Commodore 128's BASIC 7.0 has its own commands dedicated to making your job simpler. Now, what else can be done that might not have been done yet? SCREEN SHRINKING! The program I have created actually shrinks, or compresses, the pixels on the GRAPHICS 1 screen in both the horizontal and vertical directions. To do this, I devised a simple routine that uses the SCALE command. We'll go step by step to see how this is done:

1. Go to the listing and examine lines 175 through 350.
2. As you can see, there are two different values in the two SCALE commands.
3. The one on line 300 sets the normal X × Y matrix.
4. Moving back a little to line 225, the computer is instructed to store the 32 × 40 shape into string A$.
5. The next SCALE command on line 250 tells the computer it's now working with a 328 × 208 matrix.
6. The GSHAPE command on line 275 redraws the stored shape onto the screen.
7. The program continues to loop until the X and Y axes have been completely scanned.

There are several options offered after the shrinking has been completed. You can save the screen to disk, or you can shrink it again. You may also go back to the BASIC program mode, if you wish.

An important note—if you do not have a ready-made Commodore 128 hi-res screen available, you may use a *DOODLE!* screen. To use any *DOODLE!* screen, simply substitute this line for line number 125:

```
125 BLOAD"[name of DOODLE! screen]",B0,P
7168
```

Now the screen should come up. As you can see, after the program starts running, the colors, if there are any, will not match up correctly, so you may wish to take that into consideration before proceeding. If your drawing does not look attractive after it has been compressed, you can adjust the SCALE values in line 250 until the picture satisfies you. —Robert J. Tiess
Middletown, NY

```
·75 GRAPHIC1,1 : GRAPHIC 0
·100 COLOR 4,1 : COLOR 0,1 : COLOR 5,16
·125 BLOAD"FILENAME",B0,P7168
·150 GRAPHIC 1: SCALE0
·175 FOR Y = 1 TO 200 STEP 40
·200 FOR X = 1 TO 320 STEP 32
·225 SSHAPE A$,X,Y,X+31,Y+39
·250 SCALE 1,328,208
·275 GSHAPE A$,X,Y,0
·300 SCALE 1,320,200
·325 NEXT
·350 NEXT
·375 GRAPHIC 0,1
·400 PRINT"DO YOU WISH TO:"
```

```
•425 PRINT
•450 PRINT"(1) SAVE THE SCREEN"
•475 PRINT"(2) SHRINK SCREEN AGAIN"
•500 PRINT"(3) EXIT TO BASIC"
•525 PRINT:PRINT
•550 PRINT"(PRESS A KEY)"
•575 GETKEY A$
•600 IF A$="1" THEN BEGIN : SCNCLR
•625 INPUT"NAME OF SCREEN";S$
•650 IF S$ = "" THEN GOTO 625
•675 BSAVE""+S$,B0,P7168TOP16192
•700 SCNCLR
•725 PRINT DS$
•750 SLEEP 2
•775 GOTO375
•800 BEND
•825 IF A$="2" THEN GOTO 150
•850 IF A$="3" THEN GRAPHIC0,1:END
•875 PRINT CHR$(7) : GOTO 375
```

C-64 SPRDEF

Do you have a C-128 and desire to edit C-64 sprites in SPRite DEFinition mode? In C-64 mode, load your BASIC program that POKEs sprite data into memory. Run it, then press the reset switch and let it power up in C-128 mode. Type MONITOR and press RETURN. Then type T 03000 032BA 00E00 and press RETURN. Exit the monitor and enter SPRDEF. —Kyle R. Lehman
Huntertown, IN

SIMPLE SCROLL

We all know how easy it is to scroll a message upward, but have you ever tried to scroll a message downward? It's more complicated, that's for sure. The short subroutine below will do the trick for you. You have two choices: to have the message flash while scrolling, or to have a regular scroll. Just change M$ in line 10 to make it work with any message you want. —Myong Paek
Portland, OR

```
•5 REM ** DOWNWARD FLASHING **
•10 M$="FALLING LETTERS"
•20 T=20-(LEN(M$)/2)
•30 FORA=1TO23:PRINT"[CLEAR]";:B=0
•40 B=B+1:PRINT:IFB=ATHEN60
•50 GOTO40
•60 PRINTTAB(T)M$:FORW=1TO50:NEXTW
•70 NEXTA:PRINT"[HOME]"
```

```
•5 REM ** DOWNWARD SCROLLING **
•10 M$="FALLING LETTERS"
•20 T=(40-LEN(M$))/2:PRINT"[CLEAR]"
•30 FORX=1TO39:B$=B$+" ":NEXT
•40 FORA=1TO23:PRINT"[HOME]";:B=0
•50 B=B+1:PRINT:IFB=ATHEN70
•60 GOTO50
•70 PRINT"[UP]"B$:PRINTTAB(T)M$
•80 FORW=1TO50:NEXT:NEXT
•90 PRINT"[HOME]";
```

C-128 NEGATED IMAGES

There are many, many techniques for programming graphics on different computers. The BASIC 7.0 on the Commodore 128 has one of the best systems I've seen for handling graphics. There are, however, many things that have not been included within the BASIC vocabulary. For one thing, the high resolution screen has many commands that do it justice, but you cannot do such things as reverse the screen to achieve a photo negative effect. Sure, you can do this through BASIC, but are you actually willing to spend the next 10 minutes watching the screen convert?

The routine below is written in machine language for that reason. To run it, however, you do not need to have any knowledge of machine language. Just make sure when you type in the lines not to be hasty and skip something important, since the computer may crash if you do so. —Robert J. Tiess
Middletown, NY

```
•100 REM ** HI-RES SCREEN RESAVER **
•110 REM ** SYS 2048 TO REVERSE IMAGE **
•120 COLOR 0,1:COLOR 4,1:COLOR 5,15
•130 GRAPHIC0,1
•140 FOR I = 2048 TO 2096
•150 :READ A$
•160 :POKE I,DEC(A$)
•170 NEXT
•180 REM ** DATA FOR ML **
•190 DATA AD,00,20
•200 DATA 49,FF
•210 DATA 8D,00,20
•220 DATA EE,01,08
•230 DATA EE,06,08
•240 DATA AD,01,08
•250 DATA D0,ED
•260 DATA EE,02,08
•270 DATA EE,07,08
•280 DATA AD,02,08
•290 DATA C9,40
•300 DATA D0,E0
•310 DATA A9,00
•320 DATA 8D,01,08
•330 DATA 8D,06,08
•340 DATA A9,20
•350 DATA 8D,02,08
•360 DATA 8D,07,08
•370 DATA 60
```

CARD SHUFFLE

Have you ever needed to shuffle a deck of cards in a program? Or shuffle anything within a dimensioned string? This short program does just that, in two lines on the C-128 and four lines on the C-64.

The first eight lines set up a pack of 52 cards in A$(1-52) and zeros in B$(1-52). The shuffling part sets up a decreasing range for the computer to pick from randomly. Then it counts that many zeros in B$ and puts it there.

I've read many times that a card shuffling program is a long process, but this program runs about 14 seconds in the C-128's fast 2Mhz mode and about 28 seconds in the

slow 1Mhz mode.

```
•10 DATA "A[s A]","2[s A]","3[s A]","4[s
 A]","5[s A]","6[s A]","7[s A]","8[s A]",
 "9[s A]","10[s A]","J[s A]","Q[s A]","K[
 s A]"
•20 DATA "A[s S]","2[s S]","3[s S]","4[s
 S]","5[s S]","6[s S]","7[s S]","8[s S]",
 "9[s S]","10[s S]","J[s S]","Q[s S]","K[
 s S]"
•30 DATA "A[s Z]","2[s Z]","3[s Z]","4[s
 Z]","5[s Z]","6[s Z]","7[s Z]","8[s Z]",
 "9[s Z]","10[s Z]","J[s Z]","Q[s Z]","K[
 s Z]"
•40 DATA "A[s X]","2[s X]","3[s X]","4[s
 X]","5[s X]","6[s X]","7[s X]","8[s X]",
 "9[s X]","10[s X]","J[s X]","Q[s X]","K[
 s X]"
•50 DIM B$(52),A$(52):P=1:Q=52:PRINT"[CLE
 AR]";
•60 FOR T=1TO52:READ A$(T):B$(T)="0":NEXT
•70 FOR T=1TO13:PRINTA$(T),A$(13+T),A$(26
 +T),A$(39+T):NEXT
•80 PRINT"I WILL NOW SHUFFLE CARDS":FAST
•90 FORLT=QTOPSTEP-P:CD=INT(RND(P)*LT+P):
 Y=0:X=P
•100 IFB$(Y)="0"THENX=X+P:IFX=CD+PTHENB$(
 Y)=A$(LT):NEXTLT:ELSEY=Y+P:GOTO100
•110 SLOW:FORT=1TO13:PRINTB$(T),B$(13+T),
 B$(26+T),B$(39+T):NEXT:END
```

To run this program on the C-64, change lines 90 and 100 to:

```
•90 FORLT=QTOPSTEP-P:CD=INT(RND(P)*LT+P):
 Y=0:X=P
•100 IFB$="0"THENX=X+P:IFX=CD+PTHENB$(Y)=
 A$(LT):GOTO107
•105 Y=Y+P:GOTO100
•107 NEXTLT
```

—George G. Holler
Homestead, FL

CURSOR PRINT

Here's how to achieve the look of a telecommunications session with BASIC PRINT statements. A happy little cursor zips along, leaving a trail of characters in its wake.

—R. Harold Droid
Seattle, WA

```
•10 PR$(1)="[3"[DOWN]"]IF YOU WANT THE CU
 RSOR TO PRINT A"+CHR$(13)
•20 PR$(2)="MESSAGE FOR YOU, USE THIS HAN
 DY ROUTINE."+CHR$(13)
•30 PR$(3)=CHR$(13)+"LENGTHEN OR SHORTEN
 THE DELAY LOOP IN"+CHR$(13)
•40 PR$(4)="LINE 80 TO CHANGE THE PRINTIN
 G SPEED."+CHR$(13)
•50 FORK=1TO4:REM FOUR STRINGS TO PRINT
```

```
•60 FORI=1TOLEN(PR$(K)):CH$=MID$(PR$(K),I
 ,1):REM GET INDIVIDUAL CHARACTER
•70 PRINT"[RVSON] [RVSOFF]";:REM PRINT RE
 VERSE SPACE CURSOR
•80 FORJ=1TO50:NEXT:REM DELAY LOOP
•90 PRINT"[LEFT] [LEFT]"CH$;:REM PRINT SP
 ACE IN CASE CHARACTER IS CURSOR MOVE AND
  PRINT IT
•100 NEXT:NEXT
```

NUMERIC KEYPAD WITH A COMMA

Have you ever wished that the keypad on your C-128 had a comma? I have found that using the keypad makes entering data statements much faster. The comma, needed after each piece of data, slows me down considerably. The plus and minus signs or the decimal point are seldom, if ever, used in data statements. Let's change one of them to a comma. Here's how.

The Keyboard Decode Table is located in ROM, at Decimal 64128. First, we copy it in another location. The RS-232 buffer starting at Decimal 3072 will do. Here is a BASIC line to do the copying:

```
1 FOR X=0 TO 88: POKE 3072+X,PEEK(64128+
X): NEXT
```

Now, let's change the plus sign to a comma. The 74th location in the table holds 43, the CHR$ code for the plus sign. We will change it to 44, the CHR$ code for the comma. Finally, we must change the vector located at Decimal 830 and 831 to point to the new table. These locations holds the address in the conventional low byte high byte order. Divide the starting address, 3072, by 256 to find the high byte. Any remainder becomes the low byte. POKE these numbers into 830 and 831. In this case we will poke 12 in location 831. Since there is no remainder, we POKE a zero in location 830. The BASIC line to do this is:

```
2 POKE 3145,44: POKE 830,0: POKE 831,12
```

Combine these lines and you have a one line program that will make entering data a lot faster. Oh yes, if you do need the plus sign, simply hold the SHIFT key while striking the plus key or use the key located in the top row of the keyboard. If you would rather use the minus key or the decimal point, change the first POKE in line 2 to 3146 or 3154.

—Earl Caid
Jackson, MO

QUICK BOOTMAKER

I could spend hours going over the BOOTing capabilities of the 128. But, let's face it, when most of us think of creating an autoboot sector, we are just looking for a quick, effective way of putting the sector on disk. Period. Unfortunately, many programmers do not see it this way and provide us with programs with as many as 30 lines and a dozen questions. Forget it!

Quick Bootmaker will ask two simple questions: the name of the file to load, and the message you want displayed. Once that is out of the way, the boot sector is written to track 1, sector 0, and the sector is marked as allocated. That's it!

```
•100 REM* QUICK BOOTMAKER -SHAWN K. SMITH
•110 INPUT"FILENAME";F$:INPUT"MESSAGE";M$
•120 OPEN1,8,15:OPEN8,8,8,"#0":Z$=CHR$(0)
•130 PRINT#1,"B-P"8;0
•140 PRINT#8,"CBM"Z$Z$Z$Z$M$Z$Z$;
•150 PRINT#1,"M-R"CHR$(153);:GET#1,A$
•160 PRINT#8,CHR$(162)CHR$(ASC(A$)+6);
•170 PRINT#8,CHR$(160)CHR$(11);
•180 PRINT#8,"L"CHR$(165)CHR$(175);
•190 PRINT#8,":RUN"CHR$(34)F$CHR$(34)Z$;
•200 PRINT#1,"U2:"8;0;1;0
•210 PRINT#1,"B-F:";0;1;0
•220 PRINT#1,"B-A:";0;1;0:CLOSE8:CLOSE1
```

Pay special attention to punctuation when entering the program. As is, the boot sector will RUN the selected file. However, the RUN in line 190 can be changed to DLOAD, BLOAD, or BOOT. For even more control, add a line such as the following to have your own screen colors activated:

```
185 PRINT#8,"COLOR0,5:COLOR6,5:";
```

—Shawn K. Smith
Bronx, NY

AMIGA SECTION

ZING!
Meridian Software Inc.
Amiga with AmigaDOS 1.2
Price: $79.95

Last month we presented our first installment on Amiga file maintenance and floppy flinging. At that time we did not realize that it was our first installment on this esoteric topic, but as you can see it has turned out this way. This month we present *ZING!*, a full-featured AmigaDOS file and disk maintenance utility.

ZING! is provided on a nearly full (98%) AmigaDOS 1.2 Workbench disk with only 24 blocks free. As such it is meant to replace your own copy of Workbench. If you examine the *ZING!* disk you will find 17 files which start with the letter Z. These files, which total over 230,000 bytes, are the *ZING!* system. In addition, *ZING!* makes use of the AmigaDOS Diskcopy and Format commands.

Very little of the *ZING!* system actually resides on a permanent basis in the Amiga's RAM (a bit less than 25 kilobytes). After the automated installation sequence has completed its tasks, which include a request for the time and date, this minute portion of *ZING!* lurks in the background of the computer's mind patiently waiting for a recognizable Hot Key sequence. A Hot Key sequence is when the left-Amiga key is held down while pressing one of the function keys.

The default environment for *ZING!* is on the Workbench disk. *ZING!* may be reconfigured to run from RAM: or from a hard disk. The manual explains the reconfiguration procedure.

The Hot Key sequences are for use when the urge to perform AmigaDOS tasks can no longer be denied. By invoking one of *ZING's* myriad functions, the user may satisfy the AmigaDOS urge without the need to submit to the agonies of the CLI. A noticeable side effect of an indulgence in *ZING!* will be an improvement of your disk file organization. *ZING!* provides a total of 10 Hot Keys whose functions are listed in the following table:

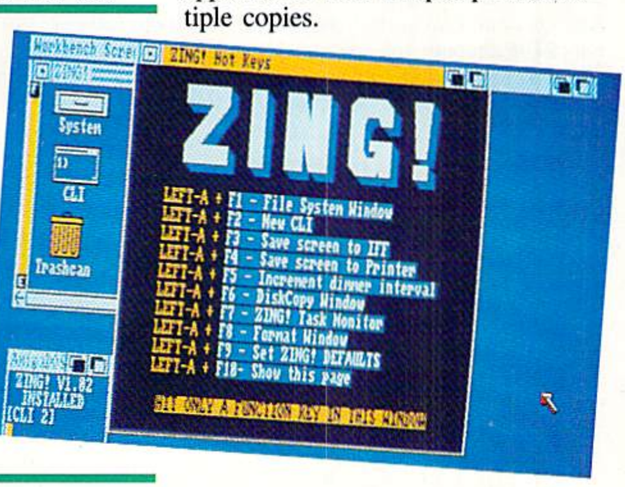
ZING! Hot Keys

F1–File System Window
F2–Open a new CLI
F3–Save screen to IFF file
F4–Print screen
F5–Screen dimmer timer
F6–Diskcopy
F7–Task Monitor
F8–Format disk
F9–*ZING!* defaults
F10–Hot Key list



ZING!'s *File System Window (top) displaying one page of a directory tree, and File Information Window (bottom).*
READER SERVICE NO. 293

If you have difficulty remembering Hot Key assignments, concentrate on F10. It will bring up a table of all the Hot Keys. Functions associated with F2, F6, and F8 correspond to AmigaDOS' NEWCLI, DISKCOPY, and FORMAT commands.



In addition to the above Hot Keys, the combination of the right Amiga key and the Delete key will disconnect *ZING!* entirely. This will result in the simultaneous removal of the small CLI window associated with *ZING!* The constant presence of this small CLI window serves as a reminder that *ZING!* is available.

If you have difficulty remembering trivia such as Hot Key assignments, you need only concentrate on one, the F10 key. This will bring up a table of all the Hot Keys. The functions associated with keys F2, F6, and F8 correspond to the AmigaDOS NEWCLI, DISKCOPY, and FORMAT commands with some improvements. For example, F8 invokes the *ZING!* format window which prompts you for all the proper parameters.

The F3 key saves the foremost screen to the disk in IFF format. A SAVE TO IFF window is automatically displayed when this function is activated. The current version of *ZING!* does not save HAM files properly. The F4 dumps the foremost screen to the printer. Three sizes of printouts are provided. The SCREENDUMP Output Window reappears after each dump to permit multiple copies.

PHOTO: MORTON KEVELSON

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If the Amiga is left unattended for more than five minutes, *ZING!* will automatically dim the screen. A touch of any key or the mouse will restore the display. Each invocation of the F5 Hot Key will increment the timer by two minutes. There is no way decrement the timer.

For those of you who may doubt that the Amiga is a multitasking machine, *ZING!* provides the definitive truth. Just invoke Hot Key F7 and you will be provided with the *ZING!* Task Monitor Window. This dynamic display shows the constantly changing status of all the tasks currently running as well as the stack pointer. Of course you will have to memorize the ROM Kernal Manual and be blessed with lightning fast reflexes to properly utilize this data. Nevertheless, multitasking doubts will be dispelled.

The File System Window, which is invoked by the Fl key, is what *ZING!* is really all about. The File System Window bears a passing resemblance to a spreadsheet. When activated it will display the root directory of the current disk. If this directory contains fewer than 20 files and directories, they will appear in a single listing the full width of the screen. The listing may be broken up into a grid with up to four columns which can display up to 100 names. With four columns on the screen, there is not enough space for the longer file names to appear. *ZING!* flags these names by highlighting their first character. If more than 100 files exist, additional pages are filled as required. A gadget at the top of the window lets you flip through the pages.

CLIMate versus ZING!

Some comparisons are fairly obvious. For example, *ZING!* is twice the price of *CLIMate.* Other comparisons are far more subtle. For example, does *ZING!* offer at least twice the power or utility of *CLIMate?* The answer to this question is a qualified yes, as it depends on the value you place on the additional features provided with *ZING!*

As can be seen from the accompanying screen photographs, *CLIMate* is the prettier of the two programs. Then again, beauty is in the eye of the beholder. We also feel that for the functions common to both programs, learning to use *CLIMate* will be easier than learning to use *ZING! CLIMate's* graphic display was so simple to comprehend that the manual was nearly superfluous.

For file display *ZING!* is the clear winner, as it automatically pauses after each screenful of data. In addition, *ZING!'s* print spooler will contribute to your productivity. The print spooler runs in the background, letting you carry on with other tasks. On the other hand *CLIMate* offers the ability to display IFF graphics files, a feature which *ZING!* lacks. However, *ZING!* does have the ability to snatch the foremost screen and save it to disk as an IFF file. *ZING!* also provides a built-in screen dump with a choice of three printout sizes.

The *ZING!* File System Window is far more versatile than what *CLIMate* has to offer. Entire directory trees may be displayed on multiple pages. On the other hand, *CLIMate* offers two windows for the source and destination disks. This makes it very easy to specify source and destination files and directories by simply pointing and clicking with the mouse. In general *ZING!* will require more keyboard activity than *CLIMate.*

The basic disk management, the *ZING!* File Info and Show Devices functions provide more information than *CLIMate's* file size and remaining disk space windows. Of course, most of the time all you are really interested in is whether or not there is room for another file on the destination disk. This information is automatically provided by *CLIMate* right where you want it. *ZING!* makes you work a bit to obtain disk and file statistics.

We were able to avoid the need to decide between the two programs by simply booting both up at the same time. As competing products, *CLIMate* and *ZING!* multitask with each other just fine. The only disadvantage to this approach is the near maddening proliferation of '.fastdir' files (from *CLIMate)* and '.Zing' files from *ZING!* all over the destination disk. Well, at least *ZING!* lets you turn off the darn things. *ZING!* will also let you erase both the '.Zing' files and the '.fastdir' files, while *CLIMate* will not display its own '.fastdir'.

In general, for most basic disk maintenance, we preferred *CLIMate* in spite of some of its limitations. In particular, *CLIMate* is very handy for organizing graphic data disks. Also, *CLIMate* tends to run faster, as all of its functions are normally in RAM:. To get the same speed with *ZING!* you will have to transfer all its files to RAM:. On the other hand *ZING!*, being disk-based, normally requires less system RAM: for its operation.

For the really big file maintenance jobs, *ZING!* is the clear winner. The directory file tree structure option is hard to beat for this application.

Virtually every AmigaDOS command that has anything to do with disk and file maintenance is available in the File System Window. All commands which require the user to input data bring up custom windows to simplify the task. Whenever possible, default data is provided in the window. Most common values, such as device names, may be changed by pointing and clicking the mouse. Ten of the more popular commands are listed along the bottom of the File System Window along with a corresponding function key. These may all be accessed by pointing and clicking or by pressing the appropriate function key. The default values for these ten commands may be changed by using the F9 Hot Key. Note that the Hot Key functions are still available in the File System Window.

All of the File System Window commands are available in the top bar menu. A complete tabulation of the File System Window menu bar is shown above.

ZING! FILE SYSTEM WINDOW MENU BAR

OPTIONS	SELECTION	FILES	DISK	SYSTEM
Update Dir	Select All	Delete	Install	Assign Symbols
Parent Dir	Unselect	Copy/Move/Merge/Rename	Format	Show Memory
Change Dir	By Pattern	Display	Diskcopy	Monitor Tasks
Next Page		Print Spooler	Relabel	Show Devices
Previous Page		File Info		
Execute Run/Batch		Display File Tree		
.Zing Files				
Help				
Quit				

Embedded in the File System Window's drag bar are three handy gadgets. The leftmost gadget displays the date and time. The center gadget normally displays the name of the current disk or directory. When this gadget is activated, it briefly displays the number of files and their total number of bytes followed by the free system RAM. The rightmost gadget is the display page flipper and page counter. The File System Window is always the full width of the display. The height of the window may be changed. If the window is shortened, the right side becomes a scroll gadget as required. Note that *ZING!* requires the 80 column display mode.

The File System Window is not limited to the display of a single directory. An entire file tree, containing up to 100 directories and 500 files, can be displayed. This should be more than adequate to display the contents of an 880K floppy disk, but may pose a problem for multimegabyte hard drives. The ability to display the entire directory tree structure, combined with mouse selection of files, results in a very powerful file maintenance tool. Each directory and file name in the tree display is preceded by a two digit number indicating its hierarchical position. For example, all directories and files in the root directory are preceded by 00. Files at the first directory level are labeled 01 and so on.

File System Window operations are greatly speeded up with the .Zing file feature. .Zing files are simply a sorted listing of all the directories and files in a directory. Whenever *ZING!* enters a new directory it will automatically create a .Zing file for it. This feature may be disabled when the .Zing files are not wanted or if the disk is getting full. *ZING!* is not fooled by .Zing files which are not up to date, as the disk is always checked when first logged in.

Overall we found *ZING!* to be a fast and powerful utility for disk file maintenance on the Amiga.

Meridian Software Inc., P.O. Box 890408, Houston, TX 77289-0408 (phone: 713-488-2144).

CHESSMASTER 2000
Software Toolworks
Amiga (512K)
Disk; $49.95

A dramatic, lovely drawing of a wizard fills the screen after the program autoboots. His fingertips hover over the ornate chess pieces as his gaze transfixes the computerist.

"I am the Chessmaster," the venerable sage intones in the Amiga's best voice synthesis. This magnificent curtain-raiser is entirely appropriate for the most colorful, visually appealing, and feature-laden computer chess program yet published.

Chess and computers go back a long way, to a time before the dawn of the home computer era. When scientists first began to open the world of microprocessing after World War II, they often picked chess as a perfect way to demonstrate the logic processing capabilities of the "electronic brains."

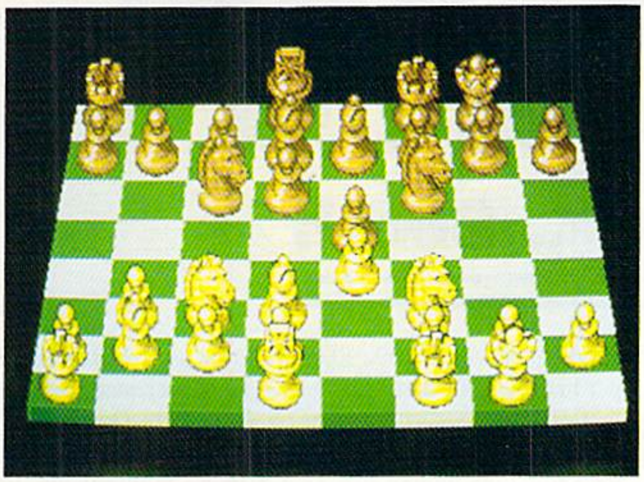
Many have nurtured the dream of an artificial intelligence device which plays chess. Centuries of scholarly analysis have endowed chess with more intellectual clout than any other game. Computer enthusiasts and chess lovers assert that the development of a chess machine capable of holding its own against a human Grandmaster would constitute a significant milestone in computer history.

In 1987, that goal is still a dream. The most powerful computer chess programs give a typical Expert tournament player a tussle, but the superstars of the 64-square arena can still beat any automated pawn-pusher.

A sticker on the package of *Chessmaster 2000* proclaims it the winner of the 1986 U.S. Open Personal Computer Chess Championship sponsored by the United States Chess Federation. This supremacy, though it surely warms the hearts of the folks at Software Toolkits (and its distributor, Electronic Arts), doesn't really define the primary value of this outstanding one- or two-player chess program. Very few players ever rise to the rarified level of Master or Grand Master. Grand Master tournament chess is as much intuitive art as logical exercise, a discipline far removed from a quick match at the high school chess club. A program which is fun to play has more practical relevance to most computerists than one which competes at an awesome skill level. In other words, features are worth more than sheer playing power to most computer chess players.

Computer chess possesses several big advantages over the non-electronic version of the game. The most compelling is that the computer relieves the chronic shortage of human opponents which besets most chessists. It doesn't even gloat when it wins.

Another plus is that programs like *Chessmaster 2000* can provide opposition geared to the computerist's own ability. *Chessmaster 2000* boasts 12



Toggling between two and three dimensions in Chessmaster 2000 *enables the user to study his position from overhead or see a perspective drawing of the battlefield.* *READER SERVICE NO. 112*

skill levels. The program thinks for 10 seconds at the lowest setting, 10 hours at the highest. So, *Chessmaster 2000* can guarantee almost anyone a competitive game.

The user can further modify the difficulty setting, by selecting the "easy" mode on the "Play" menu. This removes the program's ability to think ahead, which makes the machine easier to defeat at any given skill level.

Even the lowest setting might overwhelm a total novice, so the pull-down "Playing" menu also includes "newcomer style" for those who barely know a gambit from a checkmate.

Typical of this marvelous disk's features is that it lets the computerist set the robot player's overall style. "Normal" mixes the best moves with random ones, "Best" causes the computer invariably to choose its strongest move, and "Coffeehouse" forces the robot foe to move with unpredictable abandon.

Art Huff's graphics are praiseworthy. The chessboard and pieces are certainly the most beautiful found in any chess program, and the "Board" menu permits some eye-pleasing variations.

Toggling between two dimensions and three enables the user to study the position from overhead or see a perspective drawing of the checkered battlefield. It's possible to look at the board from any edge with the "rotate" option.

Clicking choices on the "Board" menu with the mouse can change the color of the pieces or the board, give the onscreen equipment a wood or metal sheen, or add helpful grid coordinates. The program can save customized color settings for later reuse.

Naturally, *Chessmaster 2000* has all the move-related options which have become standard on programs of this type. Selections on the "Playing" menu let the user force the computer to make a specific move, take back the last previous move, replay a previously retracted move, save a game, load a previously saved game, or shut off the program's extensive "book" of time-tested opening strategies.

These features, combined with the "Display" menu choices and the "Analyze a game" function, make *Chessmaster 2000* a powerful tool for learning how to play better. Beginners will find the "show computer thinking" and "show best variation" options particularly helpful in this regard.

Another source of instruction is the library of 100 classic chess matches. Most of the great masters are represented in the collection, which also includes a faceoff between *Chessmaster 2000* and *Sargon III.*

Documentation thoroughly covers the subject with a six-page folder and a 20-page booklet. The former covers operation of the program; the latter focuses on the library of games, rules of chess, and historical background.

When computer pioneers imagined playing chess against the machine, *Chessmaster 2000* is what they had in mind. It is, literally, a dream come true for chess-loving Amiga owners.

Software Toolworks, 9713 Santa Monica Blvd., Suite 214, Beverly Hills, CA 90210 (phone: 213-278-8450).

—Arnie Katz

Next month's Amiga reviews:

- Marauder II
- GFL Football
- Championship Baseball

DATA CREATOR

For the C-64 and C-128

By Shawn K. Smith

If you have ever gone through the process of creating data statements for your sprites, custom characters, or machine language programs, then you know how time consuming and involved this gets. *You* must PEEK the memory locations and enter the numbers into lines of data, while at the same time remembering to include those commas (not periods) and hoping that you are fortunate enough, at least this time, to enter the current values, as the stiffness in your neck refuses to cease. Involved? You bet! I remember telling myself many times that there must be a better way. And *Data Creator* is that way! Versions for the 64 and 128 are described separately below.

DATA CREATOR 64

Data Creator 64 is a 192 byte machine language utility for the Commodore 64 that will eliminate all of the abovementioned headaches associated with creating data statements for your work. Type in the program and save a copy before running it. When the program is run, the ML code will be POKEd into the cassette buffer starting at memory location 828. If an alternative location is desired, change the value of S (at the beginning of line 110) to a suitable starting address. Once the utility has been POKEd into memory, you can load and run other programs, provided that they do not overwrite the area of memory used by *Data Creator 64.*

The data to be converted must be in the computer's memory and the following statement issued:

```
SYS utility starting address, starting
line number, beginning memory address,
ending memory address, number of values
per line.
```

Utility starting address is the value of S when *Data Creator 64* was run. Starting line number is the first line which should contain data. (Increments of 10 are added as necessary.) Beginning and ending memory addresses are self-explanatory. Number of values per line means how many memory location values are supposed to occupy each line of data.

As an example, consider the following:

```
SYS 828,500,51000,51025,8
```

In this case, the utility starts at 828. The data should start at line 500 (the next will be 510). And the 26 memory locations between 51000-51025 are to be used with 8 values per line. As your data statements are being created, the lines that are produced will appear on the screen. *Data Creator* merges the lines. In other words, if your program contains the same line number that *Data Creator* is producing, the old line will be replaced. *Data Creator* leaves it up to you to insert the necessary FOR/NEXT loop to POKE the data back into memory.

Data Creator incorporates a machine language version of the dynamic keyboard technique. While the data is being created, the utility changes the IMAIN vector at ($302-$303) to point to itself. This vector is not affected by the RUN STOP/RESTORE combination. Therefore, don't press RUN STOP/RESTORE during the creation of the data statements. Should you wish to stop the process, just press the RUN STOP key.

DATA CREATOR 128

Data Creator 128 is similar to *Data Creator 64.* But several features have been added. For example, you can have the data converted into hexadecimal or decimal numbers, you can choose the desired BASIC bank number, and the ability for zero suppression has also been added. While entering the program, pay close attention to the data statements which contain the ML code for the program. (By the way, the data statements in the loader were created with *Data Creator 128.*) After entering the program, save at least one copy before running it.

When you are ready to use the program, load and run it. The loader will store the ML code into RAM beginning at the address indicated by the variable S in line 120. This may be changed to reflect an alternative starting address, e.g.: S=DEC("B00"). Once the data has been POKEd into memory, you will be reminded of the SYS to engage it. Now, make sure the information to be converted into data statements is resident, loading files if necessary. Activating *Data Creator 128,* using the SYS command, presents you with the following message:

```
SYNTAX: LINE#,BEGIN,END,BYTES,BNK,FORMAT
```

As you can see, you are given six parameters to consider, all of which are separated by commas. The first three are mandatory, while the last three are optional. Below is an explanation of each parameter followed by examples.

Line#: The first line to be used to store the data statements on. The next line (if needed) will be 10 more than the previous, etc.

Begin: The first location to have its value converted into data statements.

End: The last location to have its value converted into data statements.

Bytes: Number of values to place on each line. Default is 15.

Bnk: BASIC BANK number which contains the data (0-15). Default is 15.

Format: Use zero (0) for hexadecimal numbers or one (1) for decimal numbers. Default is 1 for decimal.

Let's assume, by way of example, that we've created eight sprites using the built-in sprite editor and are ready to convert them into data statements to be included with a BASIC program in memory. Engaging the utility and entering

```
400,3584,4095
```

creates the data statements starting at line 400, from addresses 3584-4095 with 15 decimal values on each line using BANK 15. Entering

```
400,3584,4095,10,0,0
```

puts 10 values per line, using BANK 0 and hexadecimal numbers.

There are two other features which can be controlled by the BASIC loader. These are the line increment and zero suppression. The variable INC in line 120 is set for an increment of 10. Use another value for a different increment. The variable ZS (same line) determines if zero suppression is allowed. Any non-zero value indicates zero suppression. For instance, the numbers zero and nine will be displayed as 000 and 009, respectively, when converted; with zero suppression, the same numbers become 0 and 9.

I'm not pretending to be a dentist, but I'm confident that after one use you'll agree that *Data Creator* does fill a gaping cavity in your Commodore. ☐

SEE PROGRAM LISTINGS ON PAGE 97

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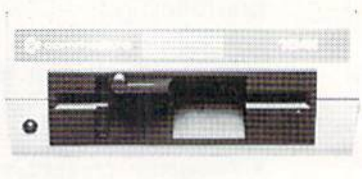
QUESTION: What do you enjoy most about the mail order business?

ANSWER: *It is always a pleasant surprise to see the great number of people who call back to order a second and third time.*

DISK DRIVE

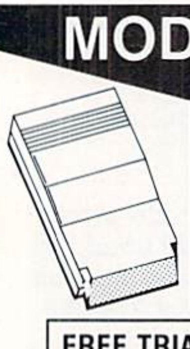
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REVIEWS

GRAPHIC CONVERSION UTILITIES

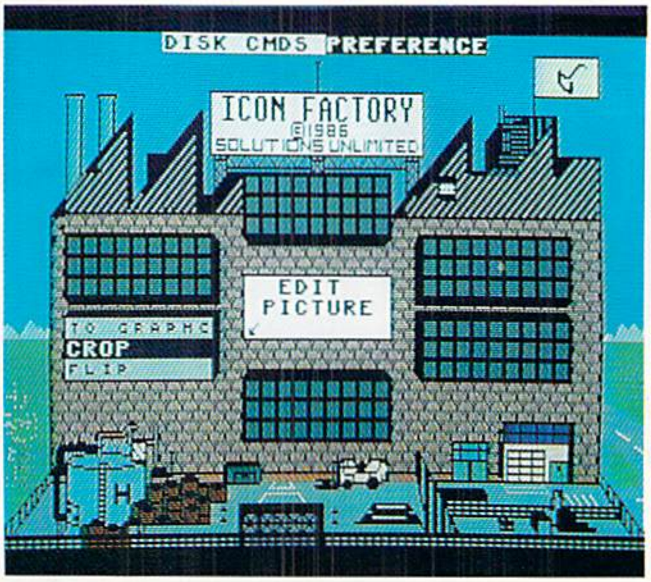
Text and Photos by Morton Kevelson

Experienced C-64 graphics artists have long realized that there is no "ideal" graphics package or display format for the C-64. Instead, all the display formats have merits for particular applications. In addition, the competing graphics packages very often complement each other with their various functions. Most C-64 graphics artists find themselves using several graphics programs for their work.

In the ideal world, all graphics programs would use the same data file format. This would allow an image created on one package to be loaded into and modified by another package. The artist would then be able to utilize the best features of each package in the creation of his images. For the Amiga, such a uniform file format exists as the IFF standard developed by Electronic Arts. Unfortunately for C-64 users, no such standard exists.

For C-64 hackers, the absence of a uniform graphic file format has never presented an obstacle. For the rest of us, we look for a graphics conversion utility to do the work. Non-artists will also benefit from effective conversion utilities. The most popular C-64 programs such as *Print Shop* and *GEOS* make the application of quality graphics available to those who have little artistic talent. Since vast graphics libraries for the C-64 exist, there are many applications for graphics conversion utilities.

To better understand the capabilities and the limitations of the 64's graphic display modes, as well as just what is possible with the graphics conversion process, we have provided a bit map graphics tutorial starting on page 41 of this issue. We suggest that you review this tutorial along with its accompanying program in conjunction with this collection of reviews.



Icon Factory's ***menu screen is a graphic representation of a multistory factory. Most functions are selected from a set of six windows that open one at a time. A central window indicates the functions of all the others. READER SERVICE NO. 274***

There are several modes of graphic conversion that will concern us on the C-64. These can be broken down into the broad categories of Bit Map Manipulation and Icon Manipulation.

Bit Map Manipulation

This category deals with the conversion of files which contain the data for a complete bit map display. With the advent of *GEOS,* this category is also concerned with images composed of more than a single 8K bit map. Within this category we can establish the following graphic conversion functions:

1. File conversion for identical display modes–This is the basic graphic conversion function. The files generated by a graphics package using a particular display mode are converted to the file format of another package using the same display mode. For example, multicolor bit mapped images are created by *Koala Painter, Paint Magic, Blazing Paddles,* and *Picasso's Revenge* (formerly *Peripheral Vision*). High-resolution bit mapped images are created by *DOODLE!, Flexidraw, Cyber Video*, and the Screen Magic portion of *Print Shop.*

Image conversion within a selected display mode can be complete with the source and destination files containing the same data. However, limitations do exist. For example, in multicolor mode *Picasso's Revenge* always uses white as the screen background nybble while *Koala Painter* permits the use of any of the 16 colors. In high-resolution mode Screen Magic files contain no color information whatsoever (black and white are always assumed), *Flexidraw* files contain limited color data in a separate file, and *DOODLE!* files contain complete color data. Conversion between these file formats requires additional intelligence on the part of the conversion program to achieve satisfactory results. In general, conversion from a file format with partial bit map data to one with complete bit map data will result in identical images. Going in the other direction may require some compromises.

2. File conversion across display modes–This involves the conversion of a file format which is in multicolor mode to a file format which is in high-

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resolution mode, or vice versa: for example, the conversion of a *Koala Painter* file which uses the multicolor display mode to a *DOODLE!* file which uses the high-resolution display mode. This type of conversion can be accomplished with varying degrees of success depending primarily on the color content of the original multicolor file and the degree of detail in the original high-resolution file. See *A C-64 Bit Map Graphics Tutorial* on page 41 for a detailed discussion of this subject.

Programs which convert across display modes must have substantial intelligence to achieve a satisfactory result. This intelligence would involve the manipulation of the bit map and color data to preserve the appearance of the image. Programs which convert multicolor to high-resolution by simply stripping away the excess color data or the reverse by just tacking on 1001 bytes of default color data will at best achieve a converted image which resembles the original in form but not in content. At worst the results may be useless.

3. Printerizing conversions–This type of conversion strips away all color data from the original file, leaving only an 8K bit map. In the process the original colors are examined and the final bit map contains patterns which correspond to the intensity of the original colors. The purpose of this conversion is to allow a simple bit map dump to a black and white dot matrix printer which generates a gray scale image corresponding to the tones of the original colors.

4. Command file conversions–Command file images contain the drawing steps used to create an image rather than the actual bit map and color data. Examples of these files are those created by *Designer's Pencil* and *Graphics Magician*. To properly handle command files the conversion program must recreate the algorithms used by the original package in order to restructure the bit map from the information contained in the command file. To date we have not seen any utilities which perform this function.

5. *GEOS* file conversions–*GEOS* image files are actually extended high-resolution bit maps. A full size *geoPaint* document is 640 dots wide by 800 dots long. The purpose of this large bit map is to create detailed images which may be used to fill an 8 by 10" printed page on a dot matrix printer. Thus a *geoPaint* document is actually equivalent to eight full C-64 high-resolution bit maps. Of course, it is impossible to display an entire *geoPaint* document on the screen at one time. In fact the actual image display area in *geoPaint* is substantially less than a 320 by 200 pixel bit map.

There are two ways to import and export C-64 bit map images into and out of *GEOS*. These are based on the two types of files in which *GEOS* stores its graphics. The Photo Scrap files are used in *GEOS* cut and paste operations. Their image content can be no larger than the visible display area of the *geoPaint* work screen. Converting a Photo Scrap file to a high-resolution bit map such as *DOODLE!* format will result in an image which is less than the full size of the *DOODLE!* screen. Conversely only a part of a *DOODLE!* image may be converted to a Photo Scrap file.

The *geoPaint* document files, in *GEOS* tech talk, are known as Variable Length Indexed Record files (VLIR). The VLIR files are actually structured as a series of files linked by a table which is also stored on the disk. As such they resemble the Commodore's relative files. This type of file structure allows for rapid access to any part of a file without having to read through the entire file in order to find the segment of data you want. This permits *geoPaint* to rapidly scroll around the drawing page by fetching image segments from the disk without having to keep the entire picture in memory. VLIR files may contain the data for an entire *geoPaint* document, all 72,000 bytes' worth. Note that *GEOS* also employs three different types of data compression in order to minimize the size of the disk files and further speed up disk transfers.

Conversion from a standard C-64 high-resolution bit map to a *geoPaint* document is thus possible. The reverse process will require that a *geoPaint* document be broken up into bit map size segments (up to eight of them).

Icon Manipulation

Some applications utilize small portions of a bit map or icons. Probably the most well known package of this sort is *Print Shop*. Since icons are intended for printing on a dot matrix printer, they do not require any color data. Icon to bit map conversions involve only a small part of the entire C-64 bit map. In fact, up to nine *Print Shop* icons can be comfortably placed on a single high-resolution bit map screen. Conversion programs for icons should have the ability to select the portion of the bit map to be converted.

The Reviews

The following reviews include both recent packages as well as some older, but still useful, programs. Although we have presented the packages in the order of estimated overall utility for the majority of users, you should not count out the packages toward the end of the reviews. In fact, serious users may find that the capabilities of the more specialized packages are essential to their work. ☐

ICON FACTORY
Solutions Unlimited, Inc.
Commodore 64
Price: $39.95

Icon Factory is a multifunction graphics conversion utility for use on files created by some of the more popular graphics packages for the C-64. As a bit map manipulator the package will handle file conversion for identical display modes as well as across display modes. For *GEOS* users a separate Grafix-Link utility is included on the distribution disk. *Icon Factory* also manipulates the icons from *Print Shop* and *PrintMaster,* as well as photo files from *Newsroom.* A list of file formats supported by *Icon Factory* follows:

ICON FACTORY FILE FORMATS

HI-RES	MULTICOLOR	GRAPHICS
DOODLE!	Koala	Print Shop
Flexidraw	Super Sketch	PrintMaster
Computereyes	Animation Station	Newsroom
Print Shop	Blazing Paddles	
GEOS	Billboard	
Billboard		

While perusing the above list, keep the following in mind. The *Print Shop* format listed under the high-resolution bit map mode is the 8K bit map created by the Screen Magic portion of that package. This file structure is identical to those created by *Flexidraw* and *Computereyes,* with the possible exception of the file load address. These files consist of pure bit map data without any color. *Flexidraw* files may have an optional color file which accompanies the bit map file. The main *Icon Factory* program will not recognize the separate *Flexidraw* color file. A stand-alone FLEXI-TO-DOODLE utility is provided on the distribution disk to convert *Flexidraw* bit map with color files to the *DOODLE!* file format which may then be manipulated by the *Icon Factory.*

GEOS files are initially handled by the Grafix-Link utility which is also included on the distribution disk. Grafix-Link will actually read in the bit map files from all the high-resolution and icon/graphics formats in the above list. It will then save in any of the high-resolution formats. *GEOS* files may occupy up to four 8K bit maps. A special view mode lets you scroll around Grafix-Link's 32K working bit map to select the 8K segment to be saved. Of course, only a single 8K bit map may be viewed at any given time.

Of the files listed under the multicolor format, *Animation Station* and *Blazing Paddles* are identical. *Koala* and *Supersketch* files are also similar, differing primarily in the structure of the file name. The *Billboard* format refers to the *Billboard Maker* utility published by the same company. *Billboard Maker* is actually a graphics conversion utility in its own right and deserves consideration along with the other programs in this roundup. See our review of *Billboard Maker* in the April 1986 *Ahoy!* Note that, contrary to what we

The publisher cannot assume responsibility for errors in the above listing.

said back then, the program does perform a shaded gray scale dump of a color image on a dot matrix printer.

While waiting for *Icon Factory's* lengthy boot up process, you will be treated to the image of an empty field upon which the factory will stand. The menu screen finally appears along with a jaunty tune. Solutions Unlimited goes all the way with the factory motif, as the menu screen is a graphic representation of an old multistory factory. The factory has three floors and an attic. Most *Icon Factory* functions are selected from a set of six factory windows which open only one at a time. The centrally positioned seventh window indicates the function of the other six windows.

At the very top of the screen, up in the clouds it seems, are the disk commands and Preference drop down menus. The former has two functions, display of the disk directory and the issuing of standard DOS commands. The latter lets you set some of the *Icon Factory's* operating parameters. The choice of currently active factory window or menu is via the function keys. This graphic user interface seems somewhat cumbersome at first. A little practice is all it takes to become comfortable with it. However, the windowing interface is not as fast as command key driven operation could be.

The first option on the Preference menu is the Optimizer toggle. The Optimizer performs a smoothing operation on images which are blown up with the Enlarge function. This works by filling in adjacent pixels to reduce the staircasing or blocking effect which would otherwise appear on diagonal lines as they are enlarged.

The next function selects the type of overlay which will be performed when copying images or parts of images from one screen to another. These options are listed in the manual as Toggle, Permanent, and Cut-out. Logically speaking, Toggle performs an exclusive or, which sets a pixel only if the source or the destination image has a set pixel but not if both are set. Permanent is a logical or, which sets a pixel if either the source or destination pixels are set. Cut-out clears the area and performs a paste operation with a one pixel clear border around the overlayed image.

The following parameter sets the number and direction of the pixel addition for the stretch function. The stretch function is used when editing graphics to add from one to three pixels either horizontally or vertically. It has the effect of thickening the lines of an image.

The last parameter selects the type of *Print Shop* icon which the *Icon Factory* will recognize. *Print Shop* icons come in two formats, which can be readily distinguished by the size of their data files. The three-block icons are used for non-Commodore printers. The two-block icons are intended for the Commodore 1515/1525/MPS-801/MPS-803 line of printers, which have less resolution than most non-Commodore printers.

Icon Factory maintains as many as three simultaneous bit maps in RAM. The first of these is a temporary bit map or scratch pad upon which the various *Icon Factory* image operations are initially performed. The other two bit maps are considered "originals" by the program. After the completion of a bit map operation, which could be nothing more than a load from disk, you are asked if you wish to SET PICTURE ORIGINAL or SET GRAPHIC ORIGINAL. The screen border turns yellow at this point, as the prompt is not always legible on the bit map display. You can always return to the menu screen by hitting N, or return to the image prior to the operation by hitting f5. This lets you experiment on the image while keeping the original intact until you achieve the effect you are looking for.

The Picture Original is a complete multicolor or high-resolution bit map image. The Graphic Original is an 8K bit map, without any color, which is used for the three icon file formats supported by *Icon Factory.*

The initial operating mode is either high-resolution or multicolor. This sets the type of file format the program

looks for when loading a picture. You can toggle between modes by hitting the H or M keys. The simplest *Icon Factory* operation is to load in an image in one of the supported formats and save it back out in one of the other formats of the same mode. The Edit Picture menu lets you do much more.

The options in the opened Edit Picture window perform several types of operations on the entire image. These include a horizontal or vertical flip of the entire image, the logical inversion of every bit in the 8K bit map, and removal of all color data. The entire bit map, less color, can also be copied to the graphic bit map. The Crop function shifts the entire image, horizontally or vertically, in either single pixel or in eight pixel increments. The single pixel movements only shift the 8K bit map, leaving color behind. The image which is shifted off the screen cannot be recovered by shifting back. Of course none of the changes are made on the Picture Original until you approve them.

The Convert function lets you change a multicolor image to a high-resolution image or vice versa. *Icon Factory* optimizes these conversions by maintaining full color when going from high-resolution to multicolor. The reverse procedure may require some compromises in the color transfer. In this case the two most "popular" colors of the four possible in an eight by eight pixel cell are used. Once an image is converted, it may be reconverted any number of times without any further image losses. Solutions Unlimited refers to their conversion algorithm as MRL for Minimum Resolution Loss.

The options in the opened Edit Graphic window add additional flexibility to *Icon Factory's* bit map manipulations. The Crop function includes a Capture Box which sets up two areas of the bit map for independent clearing. The Capture Box can be moved about the screen using the shifted I, J, K, and M keys. The size of the box can also be changed using the unshifted keys. The Capture Box size and movement are based on increments of eight pixels.

The Enlarge function blows up the top left quarter of the graphic screen to full size. This function utilizes the Optimizer if it has been turned on in the Preference menu. The Optimizer performs intelligent smoothing as the image is enlarged by checking for and ignoring crosshatch patterns and perpendicular line intersections with two or more pixels on each leg.

The Overlay function pastes the entire graphic screen onto the picture screen. The logic used by the Overlay function is set on the Preference menu as described above. The Stretch function operates on the image inside the Capture Box. Pixels are multiplied by a factor of one to three in the horizontal or vertical direction according to the Preference setting.

Two types of reduction algorithms which do not appear on the menu are

provided in the Edit Graphic mode. These are accessed via the shifted and unshifted 1, 2, and 3 keys. Both reductions shrink the entire screen to the top left quarter. The first reduction function performs an overlay of the reduced screen onto the entire screen. The other is a pure reduction which clears the rest of the screen. The relative darkness of the reduction is controlled by the number key which is pressed.

The Save Graphic window lets a part of the bit map be saved as a file in one of the three icon formats. The Capture Box is used to select the portion of the bit map to be saved. The size of the Capture Box may be adjusted for *Newsroom* photos. *Print Shop* and *PrintMaster* icons will lose the bottom four pixels in the Capture Box, as these icons are not an integral multiple of eight bits high.

Icon Factory comes with a reasonably well organized 24-page manual and a couple of slips of paper which describe the latest additions to the program. Additional documentation on the most recent changes is found on a disk file. A careful reading of the manual was required to discover all the program's features. Many options are mentioned only once in unexpected places. For example, the CTRL-P sequence, which generates a dump of the graphic screen to a 1525 compatible printer while in the Crop mode, and the use of the space bar to remove the set image prompt are only mentioned in the Hints section. Much of our initial confusion was dispelled when we realized that the manual consistently used Modify Graphic and Modify Picture to describe the Edit Graphic and Edit Picture window selections.

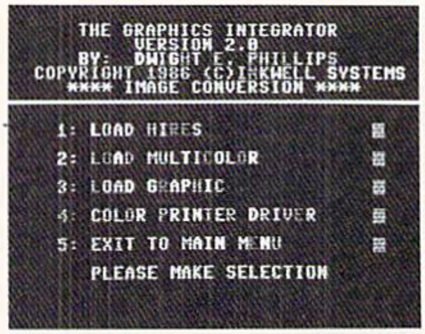
Overall *Icon Factory* does an excellent job of combining bit map mode conversions with icon conversions for the *Print Shop, PrintMaster,* and *Newsroom* programs into a single package. It provides the means to conveniently create icons for these programs by extracting portions of bit map images. The reverse process may also be performed, whereby icons can be overlayed onto full screen images. The program disk even includes several "background" scenes onto which you can place your favorite icons. The program is supplied on a copy protected disk. A single backup copy is $10.

Solutions Unlimited, P.O. Box 177, Dobbs Ferry, NY 10522-0177 (phone: 914-693-7455).

GRAPHICS INTEGRATOR 2
Inkwell Systems
Commodore 64
Price: $29.95

Graphics Integrator 2 combines graphic file format conversion with a screen dump utility for black and white as well as color printers. The program is modular, with major functions loaded in as required. *Graphics Integrator 2* leads the user via a series of menus through all of its operations.

Inasmuch as *Flexidraw,* Inkwell Systems' flagship product, is light pen driven, it comes as no surprise that *Graphics Integrator 2* accepts input from the Inkwell Systems light pen in addition to the keyboard. Light pen operation worked well enough; however, we encountered some problems with the keyboard. We found it nearly impossible to position the cursor on the selected filename unless we used the light pen. We also found that the program would occasionally refuse to acknowledge the existence of a file when selected from the onscreen display of the disk directory. In general, the setup and display of the various menus was slow and the response to user input was sluggish.



The image conversion menu from **GI 2.**
READER SERVICE NO. 275

The major program elements are selected from the opening menu. Each of these elements requires a separate load from the disk. It is always possible to return to the main menu to change operating modes. The first selection is the Image Conversion module. This manages the file conversion operations for a variety of C-64 graphics package file formats, as summarized in the table at the top of the following page.

GEOS

GEOS is handled by a separate module selection on the main menu. The *GEOS* module will accept input only from high-resolution bit maps which were saved in the *DOODLE!* file format or from a *GEOS* Photo Scrap file. In fact, the *DOODLE!* file must be named DDPHOTO SCRAP. Since *GEOS* only permits the existence of a single Photo Scrap file on any *GEOS* disk, we found that *Graphics Integrator 2* could only be used to handle one *GEOS* file conversion at a time. In addition, the largest image contained in a *GEOS* Photo Scrap file is the size of the *geoPaint* working window, which is only 264 pixels wide by 144 pixels high. This is less than 60% of a complete 8000 byte map. To accommodate the full size *DOODLE!* bit map, the *GEOS* module provides a Crop Box to

GRAPHICS INTEGRATOR 2 FILE FORMATS

HI-RES	MULTICOLOR	GRAPHICS
Flexidraw	Koala	Print Shop
DOODLE!	Animation Station	PrintMaster
Print Shop	Blazing Paddles	Newsroom
Computereyes	Super Sketch	
Cad Pak 64	Billboard Maker	
Billboard Maker		

let you select the portion of the image to save in the *GEOS* Photo Scrap file.

The image conversion module lets you select either high-resolution or multicolor mode to work with. You then select the original file format. The file is loaded into a work area and you are given the option of using the displayed image. At this time you may also generate a color printer dump if you had previously loaded in a color printer driver. *Graphics Integrator 2* provides drivers for the Diablo C 150, Epson JX80, and the Canon PJ-1080 color printers. Black and white printer dumps are done via a separate module on the main menu.

Once an image has been accepted it may be saved out to a different file format in the same mode or it may be converted to the alternate bit map mode or to a graphic. Graphics are of course stripped of all color. Bit map mode conversions are limited by the capabilities of the C-64, with high-resolution to multicolor losing resolution and the reverse process losing color. Once an image has been converted, subsequent conversions display no visible changes. After each conversion you are shown the results and given the option of accepting it.

When saving a graphic file you select a part of the bit map with a properly sized Crop Box. The Crop Box for *Newsroom* files is the maximum permissable size and cannot be made any smaller. The Crop Box may be shifted in eight pixel increments, or the underlying bit map may be shifted in one pixel increments. Parts of the image which are shifted off the edge of the display are cleared.

The Picture Printer module is similar to the screen dump option included with *Flexidraw.* A wide range of printers and interfaces are supported. All images to be printed must first be saved as *Flexidraw* files without color. If your printer's resolution is great enough, you will have the option of loading in two images and printing them side by side. This goes along with *Flexidraw's* ability to create double width images by linking two images on the display.

The *PaperClip* File Creator Module is designed to convert *Flexidraw* or *DOODLE!* files into a sequential file that can be loaded and printed by the *PaperClip* word processor revision C or later. Depending on your printer, you can create a file with two pictures side by side. The resulting file may be integrated into a *PaperClip* document and printed out with *PaperClip.*

The remaining main menu selection is a built-in slide show. This routine works only with high-resolution bit map files saved in the *DOODLE!* format. Images are brought to the screen in three ways, using a Sparkle or glitter effect, using a Shutter or vertical venetian blind effect, or using a Door effect where the image spreads from a vertical line in the center of the screen. You may select any one display mode, cycle through all three in sequence, or let the computer choose a random mix of the three modes. It is possible to change display modes during the show. The order in which the images are displayed always follows the order in which they were saved to the disk. There is no way to change the timing of the display interval.

Somehow the original *Graphics Integrator* passed us by. Perhaps it is just as well, as *Graphics Integrator 2* did not live up to our expectations. The problem is actually in the superior quality of the software packages we have previously seen from Inkwell Systems, in particular *Flexidraw* and *Flexifont.* If we did not have these packages to look back on we might have accepted *Graphics Integrator 2* for what it is—a general purpose C-64 graphics conversion and printer dump utility.

Graphics Integrator 2 is supplied on a copy protected disk with copies of the program on both sides of the disk. Replacement disks are available for $8.

Inkwell Systems, P.O. Box 85152 MB290, San Diego, CA 92138 (phone: 619-268-8792).

GRAPHIC CONVERSION FOR THE COMMODORE 64
Hi-Tech Graphics
Commodore 64
Price: $20.00

Graphic Conversion (the full title is as written above) has been around for some time. As such it supports some of the earlier graphic packages for the C-64 which are not recognized by the more recent crop of graphics utilities. The following is a table of graphics file formats which *Graphic Conversion* will accept:

FILE FORMATS RECOGNIZED BY *GRAPHIC CONVERSION*

HI-RES	MULTICOLOR	GRAPHICS
DOODLE!	Koala	Print Shop
Cadpak-64	Flying Colors	
ULTRABASIC-64	ULTRABASIC-64	
HES Graphics	HES Graphics	
BASIC	BASIC	
Any 32 Block File		

Note that these formats can be used as input data for *Graphic Conversion*. The file output formats are limited to *DOODLE!* for high-resolution bit map mode, *Koala* for multicolor bit map mode, a 32 block file of the 8000 byte bit map, and *Print Shop's* three block icon files. The entry for 32 block files refers to just the bit map data without color. Examples of this file format are *Flexidraw, Computereyes,* and *Print Shop* (Screen Magic).

Graphic Conversion lacks many of the bells and whistles provided by some of the other commercial offerings. Instead it is a fast, easy to use utility which does a good job of converting between the C-64's bit map display modes. The program will automatically read the disk directory and present a numbered list of files which it recognizes. Simply pick a file by number and let it load in. During the image load the available commands are displayed on the screen. You may want to frantically scribble these down, or better yet just refer to the list in the six sheet manual.

After the load is complete the image is displayed, at which time several options are available. Pressing the f1 key will start a color flashing on the screen. Repeated presses of the f1 key flashes the next color in the C-64's 16 color sequence. Pressing the f3 key stops the flashing and cycles the selected color to the next one. When you have changed the color to what you want, just press f5 to blink the next color. A second press of the f5 key exits the color change cycle. The f7 key is used to restore the image's original colors.

The I key will invert the status of every pixel in the bit map. This may or may not result in a negative effect, depending on the colors which form the image. A second press of the I key re-inverts the bit map and restores the original image.

Pressing the C key executes the multicolor/high-resolution conversion. Conversion always results in the opposite mode. Some additional intelligence has been added to the conversion routine. Converting from high-resolution to multicolor may result in intermediate shades between areas of high color contrast. This tends to preserve the original image contours in spite of the resulting loss of resolution. If the original image was a pure 8000 byte bit map (32 block file), it will convert to a multicolor image. Some of the original black and white areas may come up in shades of gray. The grays can be darkened or lightened to taste by using the color controls as described above.

The B key will take any color image (high-resolution or multicolor) and convert it to black and white. The original colors will be turned into a gray scale by varying density bit patterns. This preserves the tonal values of the original colors. The resulting image is ideal for printing on a dot matrix printer. The B key has no effect on the 32 block image files.

Color images may be saved with the D key to *DOODLE!* or *Koala* format according to their display mode. The S key will save the image as an 8000 byte bit map without any color data. If the image is in color, it will be converted to black and white before saving. The P key will compress the image into a three block icon file for use with *Print Shop*. This should be used only with simple images, as a tremendous loss of resolution is an inevitable part of the process.

The *Graphic Conversion* disk has two additional utilities. The BGRAF TO DOOD program converts an image file created by Commodore's B/GRAPH package into *DOODLE!* format. B/GRAPH is a program which displays tabular data in various graphic formats such as bar graphs, line graphs, and pie charts.

The D TO P CONVERT program is a more sophisticated routine for converting *DOODLE!* files to *Print Shop* three block icon files. It is written in compiled BASIC and requires about 12 minutes to convert a single image. When converting you are given a choice of the left, middle, or right parts of the *DOODLE!* image which will be used for the conversion. You also choose between light, medium, and dark conversions. The images are never displayed on the screen, making trial and error experimentation a time consuming process.

Graphic Conversion for the Commodore 64 is a low-cost package with some useful features not available anywhere else. It is worth looking into.

Hi-Tech Graphics, P.O. Box 446, Tallmadge, OH 44278-0446 (phone: 216-633-7966).

CHAMELEON
Loadstar
Commodore 64
Price: $19.95

Chameleon was originally published in the July/August 1985 issue of *Commodore Microcomputers* magazine. This makes it potentially the least expensive graphics conversion utility in our roundup. It was written by David Darus and Louis Wallace, who has

Continued on page 98

COMAL COLUMN

AGAIN AND AGAIN

By Richard Herring

The seasons they go round and round. Circle the wagons. What goes around comes around. Round and round she goes and where she stops nobody knows.

This month we will become nobodys—we'll know "where she stops." Much of our personal lives involve repetitious activity, whether it's adding ingredients to the recipe, going to work, or programming. Looping or repetition (iteration if you prefer the more exact term) is at the heart of virtually every non-trivial programming effort.

In many BASICs, repetition is limited to the FOR/NEXT structure, which is essentially a counting mechanism to allow a series of program statements to be executed a predetermined number of times.

COMAL, conversely, has all of the repetition structures you will ever need. COMAL offers a smorgasbord comprised of FOR/NEXT, REPEAT/UNTIL, WHILE/DO, and LOOP/EXIT structures. Why so many ways to send our programs running in circles? There's only one possible path for a circle, right?

True, a circle is a circle. But these various structures give us, as programmers, the control we need over deciding when to exit the circular repetition of a set of commands and why to exit.

Rather than try to remember the variations among these structures as we continue in this narrative, take a moment to look at the table. In it you will find the essential differences. If you understand everything in the chart, then I'll see you next month. Otherwise let's look at why the differences are significant.

Structure	FOR	REPEAT	WHILE	LOOP
Where the exit test falls in relation to statements:	before	after	before	middle
# of statements that will be executed at least once:	none	all	none	some
Exit when the logical test evaluates to:	False	True	False	True
Condition logically tested is what kind of expression?	numeric	numeric*	numeric*	numeric*
Is there a one line version of this structure?	yes	no**	yes	no

*String comparison is okay for all but the FOR.
**yes in COMAL 2.0.

Each of these structures presents us with a convenient way to execute a block of statements (commands) over and over. Repeating structures like this have two essential elements: a body composed of a series of program statements and a terminating condition that, when met, signals the end of the repetition.

Hang tight for a couple of dry paragraphs as we look at the lay of this programming land. We need to have a basic understanding of the structures before we continue. (Note that [ ] brackets are used to indicate optional parts of the structure while < > brackets show required parts where you must insert the proper items. The brackets themselves are not part of the structure.)

The FOR structure looks like this:

```
FOR <control variable>:=<starting value> TO <ending
                              value> [STEP <step value>] DO
  <statements>
ENDFOR [control variable]
```

The control variable is the counter, initially set to equal the starting value, and is incremented by one (or by the value of STEP) every time the loop is completed. Repetition ends when the control variable exceeds the ending value.

The REPEAT structure looks like this:

```
REPEAT
  <statements>
UNTIL <condition>
```

The statements in REPEAT are executed again and again, and as long as the final UNTIL condition is not met will evaluate False.

The WHILE structure looks like this:

```
WHILE <condition> DO
  <statements>
ENDWHILE
```

If the initial WHILE condition is True, the statements are executed. Once it evaluates False, the statements are skipped and program execution continues with the line following ENDWHILE.

The LOOP structure, available only in version 2.0, looks like this:

```
LOOP
  <statements>
  EXIT [WHEN <condition>]
  <statement>
ENDLOOP
```

When LOOP's exit condition is met (True), LOOP ends with only some of the statements having been executed in the last repetition.

Dry enough for you? Me too. So what's the significance? Power. Power for the programmer. FOR gives us an easy way to cycle through a loop a fixed number of times. None of the statements are necessarily executed because FOR tests the control variable against the ending value first.

REPEAT guarantees us that every statement will be executed at least once. REPEAT's test is at the end. REPEAT acts first and asks questions later.

In WHILE loops, the condition that kicks you out of the loop is evaluated first—before the statements in the loop are run even once. WHILE is cautious; it looks before it leaps.

WHILE differs from FOR in two ways. WHILE does not loop a set number of times, it repeats until a condition is met. And WHILE can test not only numeric expressions, like FOR compares values, but also can compare string expressions; essential if you are handling text.

WHILE is probably the most general looping control structure because it includes the possibility that the loop will not cycle at all and it gives the programmer the broadest range of control in specifying the exit condition.

LOOP gives you the chance to exit in the middle of the series of commands. As a matter of fact, proper use of LOOP demands this. LOOP with no statements after the EXIT should be REPEAT. LOOP with no statements before the EXIT should be WHILE.

Begin to get the flavor? COMAL doesn't make things possible, it makes them easy—four ways of doing essentially the same thing, for your convenience. The most convenient feature of all is COMAL's strong procedural orientation. Next time we will look at procedures and probably bust GOTO in the chops to boot.

I've been answering as many of your letters as I can keep up with. A few I'm saving for a future column so we can all share in the results. Feel free to send me your concerns, helpful hints, questions and (if I've missed something) corrections at P.O. Box 1544, Tallahassee, FL 32302. □

TECH NOTES

FOR

1) The chart shows that FOR exits when the logical test evaluates to False. A more correct way of putting this would be to say that repetition ends when the control variable is outside the specified counting range.

2) Both COMAL versions 0.14 and 2.0 substitute the command ENDFOR whenever you type NEXT. FOR/ENDFOR is more consistent with other commands like PROC/ENDPROC, CASE/ENDCASE, LOOP/ENDLOOP, and at least four other pairs of COMAL commands. Some of us still find NEXT to be more familiar and easier to read while we are programming. You can instruct version 2.0 to leave your NEXTs alone by entering:

```
POKE $C7D8,PEEK($C7D8) BITOR %00000100
```

3) Version 2.0 treats the control variable as a local variable in order to prevent variable name conflicts. A local variable is recognized only within the structure, in this case FOR. The rest of the program won't know and doesn't care about the local variable and how you manipulate it.

4) After ENDFOR, the COMAL interpreter will automatically insert the control variable name to save you some typing.

5) The value specified in STEP can be either positive or negative. If it is negative, the control value will be decreased (decremented) by that amount after each repetition of the statements until it is less than the starting value; at which point the loop will terminate.

6) A one line version of the FOR structure is available. Proper format requires that the ENDFOR command be omitted.

REPEAT

1) REPEAT is a dandy structure for reading data from files or from DATA statements.

WHILE

1) If you have only one statement to be executed in your WHILE loop, you can use the one line version of the WHILE structure. Proper format, however, requires that the ENDWHILE command be omitted.

LOOP

1) LOOP should only have one exit. If you give it several, you have crossed the boundary out of structured programming. (But it *is* allowed.)

2) The EXIT command does not have to be in the form EXIT WHEN <some condition is met>. You can also make EXIT a conditional part of an IF statement, as in: IF <some condition is True> THEN EXIT.

GENERAL

1) Each of these iterative structures exits to the line of program code immediately following the structure (the line after ENDFOR, UNTIL, ENDWHILE or ENDLOOP) when the logical test of the condition is met.

2) Any of these looping structures can be nested within any other. Statements in the deepest (innermost) structure will be iterated a number of times equal to the product of that structure's iteration count and those of each of the loops it is nested within. Nesting is good in that it allows literally millions of executions in a single pass through the program code. It is bad if there is any redundancy because you waste an incredible amount of time.

3) Iteration, in computer programming, means the repeated execution of program statements or lines of code until some condition is met. Distinguish iteration from recursion, however. Recursion is when an executable statement refers to, or calls, the function, procedure, or program it is in. Recursion results in repeated execution of portions of your program code but is not called iteration. Straightforward iteration is generally considered both faster and more sparing of memory than recursion. But recursive algorithms are still preferred when they turn out to be more natural programming structures.

Corrections—April and May COMAL Columns

In the April issue, change "repeat" in lines 190 and 370 to "repeating"; change "question" in line 40 to "questions".

In the May issue, add the following line in the blank space at the bottom of page 50:

```
80    joystick(2,d,b)
```

COMMODARES

PROGRAMMING CHALLENGES

By Dale Rupert

Each month, we'll present several challenges designed to stimulate your synapses and toggle the bits in your cerebral random access memory. We invite you to send your solutions to:

Commodares, c/o *Ahoy!*
P.O. Box 723
Bethel, CT 06801

We will print and discuss the cleverest, simplest, shortest, most interesting and/or most unusual solutions. Be sure to identify the *name* and *number* of the problems you are solving. Also show sample runs if possible. Be sure to tell what makes your solutions unique or interesting, if they are.

Programs on diskette (1541 format only) are welcome, but they must be accompanied by listings. You must enclose a stamped, self-addressed envelope if you want any of your materials returned. Solutions received by the middle of the month shown on the magazine cover are most likely to be discussed, but you may send solutions and comments any time. Your original programming problems, suggestions, and ideas are equally welcome. The best ones will become *Commodares*!

PROBLEM #43-1: EULER'S PRIMES

This problem was submitted by Ariel Kroszynski (Lyngby, Denmark). Ariel credits the problem to the great Swiss mathematician Leonhard Euler (pronounced "oiler"). Consider the expression M = 1 + 2 ↑ (2 ↑ N). For N=0, 2 ↑ N=1 and M=3. For N=1, 2 ↑ N=2 and M=5. For N equal to 2, 3, and 4, the value of M is prime (divisible only by itself and 1). For N=5, M is not prime, but it is the product of two prime numbers. Your challenge is to find those two primes. It sounds easy enough. I wonder how Euler did it.

PROBLEM #43-2: PERM PARITY

Here is a real challenge from Bret Ekstrand (Signal Hill, CA). The user inputs any permutation of the five digits 1, 2,3,4, and 5. The computer tells whether it is an even or an odd permutation.

Definitions and examples are definitely in order. Every permutation or arrangement of the five digits can be obtained by exchanging pairs of digits. For example, 14325 is obtained by exchanging the 2 and the 4 in the original 12345. Since 14325 is obtained with only one exchange (and one is an odd number), it is a permutation of odd parity.

An example of even permutation is as follows: the permutation 13425 can be obtained from 12345 by transposing the 2 and 4, giving 14325 as before, and then swapping the 3 and 4. Therefore 13425 is an even permutation since two exchanges were needed.

PROBLEM #43-3: RANDOM ORDER

Try this one from Paul Sobolik (Pittsburgh, PA). The user enters two integer values as limits. The computer displays all integers within (and including) the limits, once and only once, in random order. For example, if the inputs are 3 and 8, the output might be 7 8 3 6 4 5.

PROBLEM #43-4: FRACTION FUN

Given this fraction where each digit is represented by a letter, and all nine digits are different:

```
ABC / DEFGHI
```

When this fraction is inverted, it has the same value as its new denominator. Write a program to find the values of the digits. This problem is suggested by *Diversions and Pastimes* by R.M. Abraham (Dover, 1964). How many solutions can you find?

This month we will look at the best solutions to *Commodares* from the March 1987 *Ahoy!* Although they were a powerful set of challenges, our readers were equally powerful in creating interesting and well-designed solutions.

Problem #39-1: Exponential Power as submitted by Nolan Whitaker (Jeffersonville, KY) required the user to enter values for N and X. These values were used in this expression to approximate the exponential function EXP(X):

```
1 + (X^1 / 1!) + (X^2 / 2!) + (X^3 / 3!)
+ ... + (X^N / N!)
```

where X ↑ N means X raised to the Nth power, and N! (N factorial) is 1 * 2 * 3 * ... * N.

The exponential function of a number EXP(X) is simply the transcendental number e (roughly 2.71828) raised to the Xth power. It is the inverse function of the natural logarithm (LOG in BASIC) of the number: EXP(LOG(X)) LOG(EXP(X)) = X. (By the way, for what range of X values are these expressions actually equivalent in BASIC?)

Lon Olson (Mesa, AZ) and Scott Duncan (Superior, NE) sent equivalent solutions using only two assignment statements within a FOR/NEXT loop. Ellis Hormats (Maitland, FL) added one useful feature, an accuracy determination. The solution below is a composite of these programs:

```
•1 REM ==================================
•2 REM    COMMODARES PROBLEM #39-1 :
•3 REM    EXPONENTIAL POWER
•4 REM    SOLUTION BY
•5 REM    SCOTT DUNCAN, LON OLSON, AND
```

```
•6 REM     ELLIS HORMATS
•7 REM ===================================
•10 PRINT"EVALUATE N TERMS OF SERIES APPR
 OXIMATION FOR EXP(X)"
•20 INPUT "INPUT X,N";X,N
•30 T=1 : E=1
•40 FOR Z=1 TO N
•50 T=T/Z*X : E=E+T
•60 NEXT Z
•70 PRINT "E [UPARROW]";X;"IS APPROXIMATE
 LY "E
•80 PRINT " WITH AN ACCURACY OF" 100*(1-T
 *X/Z);"%"
```

You can watch E approach its final value if you add this line:

```
55 PRINT Z, E, 100*(1-T*X/(Z+1))
```

The percentage accuracy approaches 100% as the number of terms increases. If you use series approximations in your programs, you may test the accuracy each time through the loop to decide when the result is accurate enough.

This method of series approximation is used in calculators and even in BASIC to evaluate logarithmic and trigonometric functions. Dr. Hormats mentioned that this is a MacLaurin series (related to the Taylor series). You can find out more about series approximation in books on numerical analysis.

Some readers used the power function (up arrow) in their calculations. The power function is best avoided, when possible, for at least two reasons: it is much slower than multiplication, and it is less accurate. In particular, there is no reason to use the power function to square a number. It is always better to use X * X than X ↑ 2. The power function is more appropriate for higher powers and non-integer powers.

Many readers enjoyed solving *Problem #39-2: Electric Power* submitted by Steven Steckler (Columbia, MD). Some people were confused by the rate table. A few surmised (properly) that the rates given in "cents per kWH" should have been "dollars per kWH" as in the following table:

12 kilowatt-hours (kWH) or less	=	$2.79
next 78 kWH or less	=	$0.1259 per kWH
next 510 kWH or less	=	$0.1052 per kWH
balance over 600 kWH	=	$0.0928 per kWH

A table of this type is cumulative. For example, if you use 100 kWH, you pay $2.79 for the first 12 kWH, and 78 times $0.1259 or $9.8202 for the next 78 kWH. This accounts for the first 90 kWH (12 + 78). For the remaining 10 kWH (100 − 12 − 78 = 10), you pay 10 times $0.1052 or $1.052, giving a total bill of $13.6622 which becomes $13.66 (or perhaps $13.67?). You reach the upper rate bracket only if you use more than 600 kWH, and only the amount of energy over 600 kWH is paid at $0.0928 per kWH.

The chart which follows may clarify the rate breakdown. Notice that there are 12 units in the basic group, 78 units in Group 3, and 510 units in Group 2:

Basic	**Group 3**	**Group 2**	**Group 1**
1.....12	13.....90	91.....600	601.....
$2.79	$0.1259	$0.1052	$0.0928
total	each kWH	each kWH	each kWH

The next program is from Scott Duncan (Superior, NE).

```
•1 REM ====================================
•2 REM     COMMODARES PROBLEM #39-2 :
•3 REM     ELECTRIC POWER
•4 REM     SOLUTION BY
•5 REM     SCOTT DUNCAN
•6 REM ====================================
•10 R=2.79
•20 FOR I=1 TO 3:READ U(I),R(I): NEXT I
•30 DATA 600, .0928, 90, .1052, 12, .1259
•40 INPUT "INITIAL, FINAL METER READINGS"
 ;U1,U2 : U=U2-U1
•50 FOR I=1 TO 3
•60 J=U-U(I)
•70 IF J>0 THEN R=R+J*R(I) : U=U-J
•80 NEXT
•90 PRINT R "IS DUE"
```

The U( ) array stores the maximum number of units in each group. R( ) stores the rates for each group. The total units of energy used are calculated and stored in U. The total bill R is initialized to $2.79 in line 10.

An intermediate variable J is used to determine the number of energy units (kWH) for each of the three upper price groups. The total bill is incremented and the number of units is decremented in line 70 only if J is a positive number. J is positive only if enough units were used to qualify for the selected group.

Perhaps the best way to understand this is to "play computer." Choose some number for U then follow through each step of the program. Use paper and pencil to calculate the values just as the computer would.

This two-liner from David Hoffner (Brooklyn, NY) uses a different approach.

```
•1 REM ====================================
•2 REM     COMMODARES PROBLEM #39-2 :
•3 REM     ELECTRIC POWER
•4 REM     SOLUTION BY
•5 REM     DAVID HOFFNER
•6 REM ====================================
•10 INPUTA:B=2.79-.1259*(A-12)*(A>12)+.02
 07*(A>90)*(A-90)+.0124*(A>600)*(A-600)
•20 PRINT INT(100*B+.5)/100
```

David's program starts with $2.79. If the number of kilowatt-hours is greater than 12, the total amount greater than 12 is multiplied by $0.1259. For amounts in the two upper rate groups, the program subtracts the rate difference between the upper group and the next lower group.

For example, energy in Group 2 costs $0.0207 less ($0.1259 − $0.1052) than energy in Group 3. Energy in Group 1 costs $0.0124 less ($0.1052 − $0.0928) than in Group 2. The subtraction is obscured by the use of logical

expressions (A>90) and (A>600). These expressions have the value −1 if they are true and the value 0 if they are not true. Consequently if A is greater than 90, $0.0207 times the amount by which A exceeds 90 is subtracted from the total amount.

Line 20 of David's program rounds the result to the nearest cent. Amounts less than one-half cent are rounded down, and amounts greater than or equal to one-half cent are rounded up.

Problem #39-3: Binary Power was a challenge from Dr. Petrie Curryfavor sent by his alter ego Eddie Johnson (Albuquerque, NM). The user inputs an integer between 0 and 255. The program displays the binary equivalent of the number, the mirror image (reversed bit order) of the binary number, and the decimal value of the mirror image. A challenge for advanced programmers was to use this binary mirror routine to create a mirror-image character set.

There were many interesting solutions to the basic problem and the advanced challenge as well. Among the shortest solutions is this one from David Alan Wright (New Britain, CT).

```
1 REM ===================================
2 REM     COMMODARES PROBLEM #39-3 :
3 REM     BINARY POWER
4 REM     SOLUTION BY
5 REM     DAVID ALAN WRIGHT
6 REM ===================================
10 INPUT"NUMBER TO CONVERT";N:FORI=7TO0S
TEP-1:J=2[UPARROW]I:K=INT(N/J):A$=RIGHT$
(STR$(K),1):B$=B$+A$:C$=A$+C$:X=X+K*2[UP
ARROW]ABS(7-I):N=N-J*K:NEXT:PRINTB$,C$,X
```

C-64 users will need to break this program into two lines. B$ and C$ store the original binary value and the mirror image binary value. X stores the decimal value of C$.

This short one from F. John Enos (Weston, CT) uses the COMAL 2.0 cartridge with Super Chip.

```
1 REM ===================================
2 REM     COMMODARES PROBLEM #39-3 :
3 REM     BINARY POWER
4 REM     SOLUTION BY
5 REM     F. JOHN ENOS
6 REM ==COMAL 2.0 CART W/SUPER CHIP=====
10 DIM B$ OF 9, OP$ OF 9
20 USE MATH
30 INPUT "A NUMBER 0-255  ":N
40 B$:=BIN$(N)
50 FOR X:=0 TO 8 DO
60 OP$(X+1):=B$(9-X)
70 ENDFOR X
80 PRINT B$;
90 PRINT VAL(B$);
100 OP$:="%"+OP$
110 PRINT OP$;
120 PRINT VAL(OP$)
```

The binary conversion is trivial with the BIN$ function. The statement in line 60 replaces the bit in position (X+1) of OP$ with the (9−X)th bit from B$. Convince yourself that this creates the mirror image of B$ in OP$.

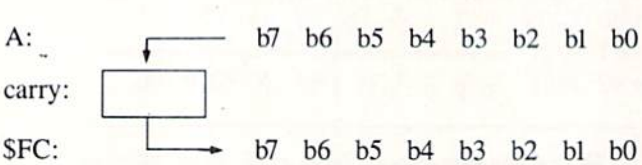
This program from Paul Sobolik (Pittsburgh, PA) is a nice blend of BASIC and machine language (ML).

```
1 REM ===================================
2 REM  COMMODARES PROBLEM #39-3 :
3 REM    BINARY POWER
4 REM  SOLUTION BY
5 REM    PAUL SOBOLIK
6 REM ===================================
10 DIM PW(7):FOR I=0TO7:READ PW(I):NEXT
20 ML=5152:FOR X=0 TO 10:READ BY:POKE ML
+X,BY:NEXT
30 N$="":INPUT"ENTER NO.";N$:N1=VAL(N$):
IF N$="END" THEN END
40 POKE 251,N1:SYS ML:N2=PEEK(252):P=N1:
GOSUB 60:B1$=P$:P=N2:GOSUB 60:B2$=P$
50 PRINT :PRINT N1,B1$,B2$,N2:PRINT:GOTO
30
60 P$="":FOR I=7 TO 0 STEP -1:I$="0":IF(
P AND PW(I)) THEN I$="1"
70 P$=P$+I$:NEXT:RETURN
80 DATA 1,2,4,8,16,32,64,128
81 REM ===================================
82 REM  $FB HOLDS THE NUMBER TO BE
```

```
•83 REM  REVERSED.  ASL LEFT-SHIFTS BIT 7
•84 REM  INTO CARRY.  ROR RIGHT-ROTATES
•85 REM  CARRY INTO BIT 7.  Y STORES LOOP
•86 REM  COUNT.
•90 DATA 160,8        :REM ML   LDY #$08
•91 DATA 165,251      :REM      LDA $FB
•92 DATA 42           :REM LOOP ASL A
•93 DATA 102,252      :REM      ROR $FC
•94 DATA 136          :REM      DEY
•95 DATA 208,250      :REM      BNE LOOP
•96 DATA 96           :REM      RTS
```

DATA statements for the ML portion begin at line 90. The ML portion performs the bit-reversal of the given number N1. N1 is put into location 251 ($FB in hex) in line 40, then the ML routine is called. It leaves the reversed result in 252 ($FC). The subroutine at line 60 converts decimal values to their binary string equivalent.

In the ML routine, the Y register starts with a count of 8. The number to be reversed is loaded into A. At LOOP, A is shifted left with its most significant bit (msb) going into the carry flag. The ROR instruction rotates the value in $FC one bit to the right, and it brings the carry bit into the msb of the value in $FC. The process looks like this:



After decrementing Y eight times, the program falls through the BNE (branch if not equal to zero) and returns to BASIC. The eight bits which were in A are now in $FC but in reverse order.

Several readers sent solutions to the advanced problem. This solution from Russell Prater (Parker, FL) is for the C-64.

```
•1 REM ====================================
•2 REM  COMMODARES PROBLEM #39-3 :
•3 REM      BINARY POWER
•4 REM  SOLUTION BY
•5 REM      RUSSELL K PRATER
•6 REM  SCREEN CHARACTER REVERSAL
•8 REM =====  C-64 ONLY  ================
•9 REM  SELECT ADDRESS FOR CHARACTER RAM
•10 ADDR=12288 : POKE 252,ADDR/256
•19 REM   PROTECT IT FROM BASIC
•20 POKE 56,ADDR/256 : CLR
•29 REM   CODE IS RELOCATABLE; CHANGE ML
•30 ML=820 : IF PEEK(ML)<>169 THEN GOSUB
 110
•39 REM   DOWNLOAD AND REVERSE ROM
•40 SYS ML : P=PEEK(53272)
•49 REM   REDIRECT VIC CHIP
•50 POKE 53272,(P AND 240)+12
•59 REM   PRESS ANY KEY TO RESTORE
•60 GET A$ : IF A$="" THEN 60
•70 POKE 53272,P
•79 REM     PRESS ANY KEY TO REVERSE
•80 GET A$ : IF A$="" THEN 80
•90 GOTO 50
•100 END
•110 FOR I=ML TO ML+55:READ A:CK=CK+A:POK
 E I,A:NEXT:IF CK=7701 THEN RETURN
•120 PRINT"ERROR IN DATA":END
•130 DATA 169,015,133,255,169,000,133,251
•140 DATA 133,253,169,208,133,254,120,165
•150 DATA 001,041,251,133,001,160,000,177
•160 DATA 253,162,007,010,102,002,202,016
•170 DATA 250,165,002,145,251,200,208,239
•180 DATA 230,252,230,254,198,255,016,231
•190 DATA 165,001,009,004,133,001,088,096
```

It copies the character ROM into RAM, then performs the bit-reversal on each character byte. After the program is run, the screen shows bit-reversed characters. Key presses toggle between normal and mirror-image characters. RUN STOP/RESTORE returns the normal character definition.

Hold the space bar to rapidly toggle between the two character sets. It is easy to see which characters are identical to their mirror images. How?

According to the program listing from Dr. Curryfavor, his purely-BASIC program takes 74 seconds to perform the bit-reversal. You could put timer statements around the SYS ML statement in Russell's program to see how long it takes, but the whole BASIC and ML program runs in the blink of an eye.

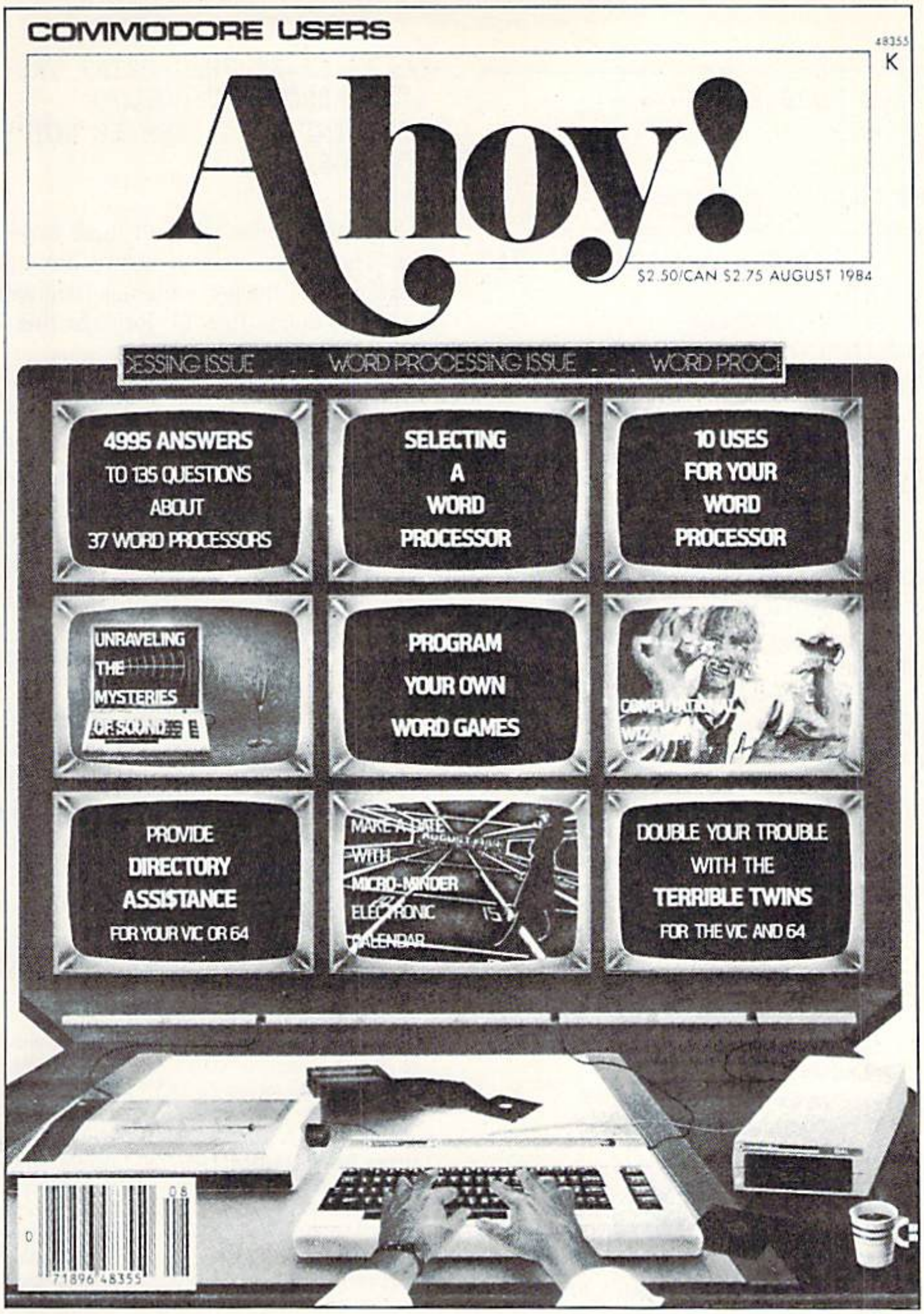
Special congratulations also to Michael Jacknis (Dix Hills, NY), Paul Vaughan (San Jose, CA), and Charles Girard (Jonquiere, PQ) for their solutions to the advanced part of this *Commodare.*

Problem #39-4: Root Power was an investigation into the calculating accuracy of BASIC. The problem is to display the values of X for which SQR (X * X) and SQR (X ↑ 2) are equal to X. Theoretically they should be equivalent for all values of X. Because numbers are stored and calculated with limited accuracy, the two sets of functions in general do not equal X.

Lon Olson (Mesa, AZ) mentioned that after reading the problem he entered the statements PRINT SQR(3 ↑ 2), SQR(3*3). The computer printed 3's for the answers. This seemed to contradict the statement in the problem which said that the results were not equivalent to 3. Then he entered PRINT SQR(3 ↑ 2)=3,SQR(3*3)=3. The computer responded with two 0's, indicating that the logical expressions in the PRINT statement were in fact not true. Even though the computer thinks that SQR(3*3) does not equal 3, when asked to give the value of SQR(3*3), it displays 3. How about that for some confusion!

The secret is that the internal representations of the results are different from the internal representation of 3. In fact PRINT (3 ↑ 2=9), (3*3=9) gives the results 0,−1 showing that 3 ↑ 2 is not stored internally the same as 9 although 3*3 is internally equivalent to 9.

Use the program at the top of page 80 from Jim Speers (Niles, MI) as a starting point for exploring the inner storage of data.



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```
•1 REM ====================================
•2 REM COMMODARES PROBLEM #39-4 :
•3 REM   ROOT POWER
•4 REM SOLUTION BY
•5 REM   JIM SPEERS
•6 REM ====================================
•100 FOR I=1 TO 256 : K=1 : IF SQR(I[UPAR
 ROW]2)=I THEN K=3
•110 IF SQR(I*I)=I THEN K=K+1
•120 ON K GOTO 160,130,140,150
•130 PRINT I;"(I*I) ONLY" : GOTO 160
•140 PRINT I;"(I[UPARROW]2) ONLY" : GOTO
 160
•150 PRINT I;"BOTH EQUAL"
•160 NEXT I
```

The value of K is adjusted according to the results of the two IF statements. The ON/GOTO statement in line 120 directs the program to the proper conclusion about the equivalence of the expressions.

If your curiosity leads you below the surface of BASIC, you can explore the internal storage of variables with this little program for the C-128.

```
1 BANK 1
2 X=SQR(3*3)
3 P=POINTER(X)
4 FOR B=0 TO 4
5 PRINT HEX$(PEEK(P+B))
6 NEXT
```

For the C-64 delete line 1. Change line 3 to this:

```
3 P = PEEK(45) + 256*PEEK(46) + 2
```

Also omit the HEX$ in line 5.

Numeric variables are stored in five bytes in the computer. This program shows the five bytes stored for the variable X. Change the expression for X in line 2 to X=3 or X=SQR(3 ↑ 2) and see that all three results are stored differently in memory.

Wallace Leeker (Lemay, MO) sent an interesting set of programs he used to analyze the problem. You will see completely different results when you run this program for the C-128.

```
•1 REM ====================================
•2 REM COMMODARES PROBLEM #39-4 :
•3 REM   ROOT POWER
•4 REM SOLUTION BY
•5 REM   WALLACE LEEKER
•6 REM ====================================
•10 DO UNTIL X%=100
•20 X%=X%+1:X$=STR$(X%):Z$=MID$(X$,2)
•30 A%=SQR(X%*X%)
•40 IF A%=X% THEN PRINT A%"=SQR("Z$"*"Z$"
 )";:GOTO50
•45 PRINT A%;  :REM IF NOT EQUAL
•50 B%=SQR(X%[UPARROW]2)
•60 IF B%=X% THEN PRINT TAB(19)B%"=SQR("Z
 $"[UPARROW]2)":GOTO70
•65 PRINT B%   :REM IF NOT EQUAL
•70 LOOP:END
```

The program shows that all three expressions are equivalent. The reason that all results are equivalent is that the program uses integer variables (denoted by the "%"). For the C-64, delete line 10. Replace line 70 with

```
70 IF X% < 100 THEN 20
```

Even though programs run more slowly with integer variables (on Commodore computers, anyway) than with floating point numbers, they clearly provide an advantage if more accurate results are needed and if the smaller range of values is acceptable. Remember that integers must be in the range −32768 through +32767. Replace the integer variables with their floating point counterparts; that is, A%, B%, and X% become A, B, and X. Now the results are just as we saw before.

Ariel Kroszynski (Lyngby, Denmark) sent a well-structured COMAL solution to *Problem #36-1: Fancy Factorials* which gives exact results for any factorial. The program is too long to list here. If you would like a listing of the program, send a legal size SASE to me at the address above with your request clearly stated.

Congratulations to these readers not already mentioned this month. It looks as though you should have enough to keep yourself busy until next month. Keep those challenges and solutions coming. □

Sean Bates (N. Stonington, CT)
Saul Betesh (Kingston, ONT)
Jim Bickers (Shepherdsville, KY)
Alan Bowen (Franklin, TN)
Kathleen Boyle (Caldwell, NJ)
Thomas Braun (Omaha, NE)
Leo Brenneman (Erie, PA)
Tom Bryant (Barksdale AFB, LA)
Gilles Cloutier (Montreal, PQ)
Don Cope
Tom Dorris (Barlow, KY)
Bret Ekstrand (Signal Hill, CA)
John B. Fisher (Mira Loma, CA)
Thomson Fung (San Diego, CA)
Tom Griffin
Herbert Hall (FPO NY, NY)
Ariel Kroszynski (Lyngby, Denmark)
Arthur Krupen (Rockford, IL)
Jerry Krupka (Lee, MA)
Keith Kushner (Brooklyn, NY)
R.A. Lathioor (W. Vancouver, BC)
John Locke (Central Point, OR)
Vincent Lui (Honolulu, HI)
Ben Margolin (Detroit, MI)
Bob Miller
Mike Patterson (Bay City, TX)
Howard Reiser (Joliet, IL)
Douglas Sattelberg (North Tonawanda, NY)
Mario Segal (Mexico City, Mexico)
Henry F. Smith (APO Miami, FL)
Thomas B. Smith (Gallipolis, OH)
Thomas Spafford (San Juan, PR)
G. Neil Spokes (Briarcliff Manor, NY)
Jeff Zimmer (Erie, PA)

PROGRAM LISTINGS

Attention new *Ahoy!* readers! You must read the following information very carefully prior to typing in programs listed in *Ahoy!* Certain Commodore characters, commands, and strings of characters and commands will appear in a special format. Follow the instructions and listings guide on this page.

On the following pages you'll find several programs that you can enter on your Commodore computer. But before doing so, read this entire page carefully.

To insure clear reproductions, *Ahoy!'s* program listings are generated on a daisy wheel printer, incapable of printing the commands and graphic characters used in Commodore programs. These are therefore represented by various codes enclosed in brackets [ ]. For example: the SHIFT CLR/HOME command is represented onscreen by a heart . The code we use in our listings is [CLEAR]. The chart below lists all such codes which you'll encounter in our listings, except for one other special case.

The other special case is the COMMODORE and SHIFT characters. On the front of most keys are two symbols. The symbol on the left is obtained by pressing that key while holding down the COMMODORE key; the symbol on the right, by pressing that key while holding down the SHIFT key. COMMODORE and SHIFT characters are represented in our listings by a lower-case "s" or "c" followed by the symbol of the key you must hit. COMMODORE J, for example, is represented by [c J], and SHIFT J by [s J].

Additionally, any character that occurs more than two times in a row will be displayed by a coded listing. For example, [3 "[LEFT]"] would be 3 CuRSoR left commands in a row, [5 "[s EP]"] would be 5 SHIFTed English Pounds, and so on. Multiple blank spaces will be noted in similar fashion: e.g., 22 spaces as [22 " "].

Sometimes you'll find a program line that's too long for the computer to accept (C-64 lines are a maximum of 80 characters, or 2 screen lines long; C-128 lines, a maximum of 160 characters, 2 or 4 screen lines in 40 or 80 columns respectively). To enter these lines, refer to the *BASIC Command Abbreviations Appendix* in your User Manual.

On the next page you'll find our *Bug Repellent* programs for the C-128 and C-64. The version for your machine will help you proofread programs after typing them. (Please note: the *Bug Repellent* line codes that follow each program line, in the whited-out area, should *not* be typed in. See instructions preceding each program.)

On the second page following you will find *Flankspeed*, our ML entry program, and instructions on its use.

Call *Ahoy!* at 212-239-6089 with any problems (if busy or no answer after three rings, call 212-239-0855).

WHEN YOU SEE	IT MEANS	YOU TYPE	YOU WILL SEE	WHEN YOU SEE	IT MEANS	YOU TYPE	YOU WILL SEE
[CLEAR]	Screen Clear	SHIFT CLR/HOME		[BLACK]	Black	CNTRL 1	
[HOME]	Home	CLR/HOME		[WHITE]	White	CNTRL 2	
[UP]	Cursor Up	SHIFT ↑ CRSR ↓		[RED]	Red	CNTRL 3	
[DOWN]	Cursor Down	↑ CRSR ↓		[CYAN]	Cyan	CNTRL 4	
[LEFT]	Cursor Left	SHIFT ← CRSR →		[PURPLE]	Purple	CNTRL 5	
[RIGHT]	Cursor Right	← CRSR →		[GREEN]	Green	CNTRL 6	
[SS]	Shifted Space	SHIFT Space		[BLUE]	Blue	CNTRL 7	
[INSERT]	Insert	SHIFT INST/DEL		[YELLOW]	Yellow	CNTRL 8	
[DEL]	Delete	INST/DEL		[F1]	Function 1	F1	
[RVSON]	Reverse On	CNTRL 9		[F2]	Function 2	SHIFT F1	
[RVSOFF]	Reverse Off	CNTRL 0		[F3]	Function 3	F3	
[UPARROW]	Up Arrow	↑	↑	[F4]	Function 4	SHIFT F3	
[BACKARROW]	Back Arrow	←	←	[F5]	Function 5	F5	
[PI]	PI	π	π	[F6]	Function 6	SHIFT F5	
[EP]	English Pound	£	£	[F7]	Function 7	F7	
				[F8]	Function 8	SHIFT F7	

BUG REPELLENT FOR THE 64 & 128 By BUCK CHILDRESS

Please note: the *Bug Repellent* programs listed here are for *Ahoy!* programs published from the May 1987 issue onward! For older programs, use the older version.

Type in, save, and run *Bug Repellent.* You'll be asked if you want automatic saves to take place. If so, you're prompted for the device, DISK (D) or TAPE (T). You then pick a starting file number, 0 through 99. Next, you enter a name, up to 14 characters long. At this point, *Bug Repellent* verifies your entries and gives you a chance to change them if you want. If no changes are needed, *Bug Repellent* activates itself. (Pressing RETURN without answering the prompts defaults to disk drive and begins your files with "00BACKUP".)

As you enter program lines and press RETURN, a *Bug Repellent* code appears at the top of your screen. If it doesn't match the code in the program listing, an error exists. Correct the line and the codes will match.

If used, automatic saves take place every 15 minutes. When the RETURN key is pressed on a program line, the screen changes color to let you know that a save will begin in about three seconds. You may cancel the save by pressing the RUN STOP key. The file number increments after each save. It resets to 00 if 99 is surpassed. After saving, or cancelling, the screen returns to its original color and the timer resets for 15 minutes.

When you've finished using *Bug Repellent*, deactivate it by typing SYS 49152 [RETURN] for the Commodore 64 or SYS 4864 [RETURN] for the Commodore 128.

C-64 BUG REPELLENT

```
10 PRINTCHR$(147)"LOADING AND CHECKING THE DATA[3"."]":J=49152
20 FORB=0TO11:READA:IFA<0ORA>255THEN40
30 POKEJ+B,A:X=X+A:NEXTB:READA:IFA=XTHEN50
40 PRINT:PRINT"ERROR IN DATA LINE:"PEEK(64)*256+PEEK(63):END
50 X=0:J=J+12:IFJ<49456THEN20
60 POKE198,0:POKE49456,0:A$="Y":B$=A$:C$="D":D$="DISK":D=8:PRINTCHR$(147)
70 INPUT"DO YOU WANT AUTOMATIC SAVES (Y/N)";A$:PRINT:IFA$="Y"THEN90
80 PRINT"NO AUTOMATIC SAVES[3"."]":GOTO150
90 POKE49456,1:INPUT"DISK OR TAPE (D/T)";C$:IFC$<>"D"THEND=1:D$="TAPE"
100 POKE49457,D:D$=D$+" DRIVE":PRINT:INPUT"FILE NUMBER (0-99)";N
110 N$=RIGHT$(STR$(N),2):IFN<10THENN$=CHR$(48)+CHR$(N+48)
120 F$="BACKUP":PRINT:INPUT"FILENAME";F$:F$=N$+LEFT$(F$,14):L=LEN(F$)
130 POKE49458,L:FORJ=1TOL:POKE49458+J,ASC(MID$(F$,J,1)):NEXTJ:PRINT
140 PRINT"SAVING DEVICE ** "D$:PRINT"STARTING WITH ** "F$
150 PRINT:INPUT"IS THIS CORRECT (Y/N)";B$:IFB$<>"Y"THEN60
160 POKE770,131:POKE771,164:SYS49152:END
170 DATA169,79,32,210,255,162,38,160,192,204,3,3,1507
180 DATA208,10,162,131,160,164,169,70,32,210,255,44,1615
190 DATA169,78,32,210,255,142,2,3,140,3,3,76,1113
200 DATA36,193,32,96,165,134,122,132,123,32,115,0,1180
210 DATA170,240,243,162,255,134,58,144,3,76,150,164,1799
220 DATA32,107,169,32,121,165,173,0,2,240,5,169,1215
230 DATA79,141,2,3,76,162,164,169,0,133,2,133,1064
240 DATA251,133,252,133,254,24,101,20,69,254,230,254,1975
250 DATA24,101,21,69,254,170,230,254,164,252,185,0,1724
260 DATA2,133,253,201,34,208,6,165,2,73,255,133,1465
270 DATA2,201,32,208,4,165,2,240,8,138,24,101,1125
280 DATA253,69,254,170,44,198,254,230,252,164,253,208,2349
290 DATA213,138,41,240,74,74,74,74,24,105,129,141,1327
300 DATA44,193,138,41,15,24,105,129,141,45,193,162,1230
310 DATA0,189,43,193,240,12,157,0,4,173,134,2,1147
320 DATA157,0,216,232,208,239,169,38,141,2,3,173,1578
330 DATA48,193,240,23,165,161,201,212,176,4,165,160,1748
340 DATA240,13,238,32,208,160,0,32,225,255,208,6,1617
350 DATA32,33,193,76,38,192,232,208,242,200,208,239,1893
360 DATA32,68,229,169,0,168,174,49,193,32,186,255,1555
370 DATA173,50,193,162,51,160,193,32,189,255,169,43,1670
380 DATA166,45,164,46,32,216,255,162,1,189,51,193,1520
390 DATA168,200,152,201,58,144,2,169,48,157,51,193,1543
400 DATA201,48,208,3,202,16,234,32,33,193,76,116,1362
410 DATA164,206,32,208,169,0,170,168,76,219,255,160,1827
420 DATA1,1,160,0,0,65,72,79,89,33,0,0,500
```

C-128 BUG REPELLENT

```
10 PRINTCHR$(147)"LOADING AND CHECKING THE DATA[3"."]":J=4864
20 FORB=0TO11:READA:IFA<0ORA>255THEN40
30 POKEJ+B,A:X=X+A:NEXTB:READA:IFA=XTHEN50
40 PRINT:PRINT"ERROR IN DATA LINE:"PEEK(66)*256+PEEK(65):END
50 X=0:J=J+12:IFJ<5213THEN20
60 POKE208,0:POKE5213,0:A$="Y":B$=A$:C$="D":D$="DISK":D=8:PRINTCHR$(147)
70 INPUT"DO YOU WANT AUTOMATIC SAVES (Y/N)";A$:PRINT:IFA$="Y"THEN90
80 PRINT"NO AUTOMATIC SAVES[3"."]":GOTO150
90 POKE5213,1:INPUT"DISK OR TAPE (D/T)";C$:IFC$<>"D"THEND=1:D$="TAPE"
100 POKE5214,D:D$=D$+" DRIVE":PRINT:INPUT"FILE NUMBER (0-99)";N
110 N$=RIGHT$(STR$(N),2):IFN<10THENN$=CHR$(48)+CHR$(N+48)
120 F$="BACKUP":PRINT:INPUT"FILENAME";F$:F$=N$+LEFT$(F$,14):L=LEN(F$)
130 POKE5215,L:FORJ=1TOL:POKE5215+J,ASC(MID$(F$,J,1)):NEXTJ:PRINT
140 PRINT"SAVING DEVICE ** "D$:PRINT"STARTING WITH ** "F$
150 PRINT:INPUT"IS THIS CORRECT (Y/N)";B$:IFB$<>"Y"THEN60
160 POKE770,198:POKE771,77:SYS4864:END
170 DATA32,58,20,169,41,162,19,236,3,3,208,4,955
180 DATA169,198,162,77,141,2,3,142,3,3,224,19,1143
190 DATA208,7,32,125,255,79,78,0,96,32,125,255,1292
200 DATA79,70,70,0,96,162,0,134,251,189,0,2,1053
210 DATA240,19,201,48,144,9,201,58,176,5,133,251,1485
220 DATA232,208,238,134,252,165,251,208,3,76,198,77,2042
230 DATA169,0,166,235,164,236,133,253,133,254,142,47,1932
240 DATA20,140,48,20,24,101,22,69,254,230,254,24,1206
250 DATA101,23,69,254,170,230,254,164,252,185,0,2,1704
260 DATA133,251,201,34,208,6,165,253,73,255,133,253,1965
270 DATA201,32,208,4,165,253,240,8,138,24,101,251,1625
280 DATA69,254,170,44,198,254,230,252,164,251,208,213,2307
290 DATA138,41,240,74,74,74,74,24,105,65,141,88,1138
300 DATA20,138,41,15,24,105,65,141,89,20,32,79,769
310 DATA20,189,85,20,240,6,32,210,255,232,208,245,1742
320 DATA174,47,20,172,48,20,24,32,240,255,173,93,1298
330 DATA20,240,27,165,161,201,212,176,4,165,160,240,1771
340 DATA17,32,65,20,238,32,208,238,1,214,32,225,1322
350 DATA255,208,6,32,49,20,76,198,77,232,208,242,1603
360 DATA200,208,239,32,66,193,173,95,20,162,96,160,1644
370 DATA20,32,189,255,169,0,170,32,104,255,169,0,1395
380 DATA174,94,20,168,32,186,255,169,45,174,16,18,1351
390 DATA172,17,18,32,216,255,162,1,189,96,20,168,1346
400 DATA200,152,201,58,144,2,169,48,157,96,20,201,1448
410 DATA48,208,3,202,16,234,32,49,20,141,0,2,955
420 DATA76,183,77,58,59,32,65,20,206,32,208,206,1222
430 DATA1,214,169,0,170,168,76,219,255,32,79,20,1403
440 DATA169,26,141,0,214,173,0,214,16,251,96,162,1462
450 DATA0,142,0,255,96,19,18,32,32,32,32,146,804
460 DATA0,1,0,0,65,72,79,89,33,0,0,0,339
```

FLANKSPEED FOR THE C-64 By GORDON F. WHEAT

Flankspeed will allow you to enter machine language *Ahoy!* programs without any mistakes. Once you have typed the program in, save it for future use. While entering an ML program with *Flankspeed* there is no need to enter spaces or hit the carriage return. This is all done automatically. If you make an error in a line a bell will ring and you will be asked to enter it again. To LOAD in a program Saved with *Flankspeed* use LOAD "name",1,1 for tape, or LOAD "name",8,1 for disk. The function keys may be used after the starting and ending addresses have been entered.

f1–SAVEs what you have entered so far.

f3–LOADs in a program worked on previously.

f5–To continue on a line you stopped on after LOADing in the previous saved work.

f7–Scans through the program to locate a particular line, or to find out where you stopped the last time you entered the program. It temporarily freezes the output as well.

```
·100 POKE53280,12:POKE53281,11                         OP
·105 PRINT"[CLEAR][c 8][RVSON][15" "]FLANKSPEED[15" "]";   FP
·110 PRINT"[RVSON][5" "]MISTAKEPROOF ML ENTRY PROGRAM[6" "
 ]"                                                    JP
·115 PRINT"[RVSON][9" "]CREATED BY G. F. WHEAT[9" "]"  FA
·120 PRINT"[RVSON][3" "]COPR. 1987, ION INTERNATIONAL INC.
 [3" "]"                                               AJ
·125 FORA=54272TO54296:POKEA,0:NEXT                    ND
·130 POKE54272,4:POKE54273,48:POKE54277,0:POKE54278,249:PO
 KE54296,15                                            NP
·135 FORA=680TO699:READB:POKEA,B:NEXT                  FL
·140 DATA169,251,166,253,164,254,32,216,255,96         FF
·145 DATA169,0,166,251,164,252,32,213,255,96           EK
·150 B$="STARTING ADDRESS IN HEX":GOSUB430:AD=B:SR=B   KP
·155 GOSUB480:IFB=0THEN150                             OE
·160 POKE251,T(4)+T(3)*16:POKE252,T(2)+T(1)*16         AM
·165 B$="ENDING ADDRESS IN HEX":GOSUB430:EN=B          PE
·170 GOSUB470:IFB=0THEN150                             PG
·175 POKE254,T(2)+T(1)*16:B=T(4)+1+T(3)*16             GM
·180 IFB>255THENB=B-255:POKE254,PEEK(254)+1            HG
·185 POKE253,B:PRINT                                   EC
·190 REM  GET HEX LINE                                 ED
·195 GOSUB495:PRINT": [c P][LEFT]";:FORA=0TO8          KD
·200 FORB=0TO1:GOTO250                                 IH
·205 NEXTB                                             IJ
·210 A%(A)=T(1)+T(0)*16:IFAD+A-1=ENTHEN340             FA
·215 PRINT" [c P][LEFT]";                              EG
·220 NEXTA:T=AD-(INT(AD/256)*256):PRINT" "             II
·225 FORA=0TO7:T=T+A%(A):IFT>255THENT=T-255            GL
·230 NEXT                                              GI
·235 IFA%(8)<>TTHENGOSUB375:GOTO195                    FL
·240 FORA=0TO7:POKEAD+A,A%(A):NEXT:AD=AD+8:GOTO195     IM
·245 REM    GET HEX INPUT                              PA
·250 GETA$:IFA$=""THEN250                              GA
·255 IFA$=CHR$(20)THEN305                              GO
·260 IFA$=CHR$(133)THEN535                             LM
·265 IFA$=CHR$(134)THEN560                             IG
·270 IFA$=CHR$(135)THENPRINT" ":GOTO620                HO
·275 IFA$=CHR$(136)THENPRINT" ":GOTO635                HE
·280 IFA$>"@"ANDA$<"G"THENT(B)=ASC(A$)-55:GOTO295      MI
·285 IFA$>"/"ANDA$<":"THENT(B)=ASC(A$)-48:GOTO295      DJ
·290 GOSUB415:GOTO250                                  JA
·295 PRINTA$"[c P][LEFT]";                             PK
·300 GOTO205                                           FA
·305 IFA>0THEN320                                      BI
·310 A=-1:IFB=1THEN330                                 BB
·315 GOTO220                                           FA
·320 IFB=0THENPRINTCHR$(20);CHR$(20);:A=A-1            BF
·325 A=A-1                                             FK
·330 PRINTCHR$(20);:GOTO220                            PH
·335 REM LAST LINE                                     CP
·340 PRINT" ":T=AD-(INT(AD/256)*256)                   KH
·345 FORB=0TOA-1:T=T+A%(B):IFT>255THENT=T-255          OD
·350 NEXT                                              OB
·355 IFA%(A)<>TTHENGOSUB375:GOTO195                    LH
·360 FORB=0TOA-1:POKEAD+B,A%(B):NEXT                   BO
·365 PRINT:PRINT"YOU ARE FINISHED!":GOTO535            MB
·370 REM BELL AND ERROR MESSAGES                       LM
·375 PRINT:PRINT"LINE ENTERED INCORRECTLY":PRINT:GOTO415   JK
·380 PRINT:PRINT"INPUT A 4 DIGIT HEX VALUE!":GOTO415   PG
·385 PRINT:PRINT"ENDING IS LESS THAN STARTING!":B=0:GOTO41
 5                                                     IK
·390 PRINT:PRINT"ADDRESS NOT WITHIN SPECIFIED RANGE!":B=0:
 GOTO415                                               HK
·395 PRINT:PRINT"NOT ZERO PAGE OR ROM!":B=0:GOTO415    DM
·400 PRINT"?ERROR IN SAVE":GOTO415                     JK
·405 PRINT"?ERROR IN LOAD":GOTO415                     IO
·410 PRINT:PRINT:PRINT"END OF ML AREA":PRINT           JO
·415 POKE54276,17:POKE54276,16:RETURN                  BF
·420 OPEN15,8,15:INPUT#15,A,A$:CLOSE15:PRINTA$:RETURN  DH
·425 REM GET FOUR DIGIT HEX                            IM
·430 PRINT:PRINTB$;:INPUTT$                            OL
·435 IFLEN(T$)<>4THENGOSUB380:GOTO430                  JD
·440 FORA=1TO4:A$=MID$(T$,A,1):GOSUB450:IFT(A)=16THENGOSUB
 380:GOTO430                                           AK
·445 NEXT:B=(T(1)*4096)+(T(2)*256)+(T(3)*16)+T(4):RETURN   KB
·450 IFA$>"@"ANDA$<"G"THENT(A)=ASC(A$)-55:RETURN       GM
·455 IFA$>"/"ANDA$<":"THENT(A)=ASC(A$)-48:RETURN       NJ
·460 T(A)=16:RETURN                                    IC
·465 REM ADDRESS CHECK                                 OL
·470 IFAD>ENTHEN385                                    HO
·475 IFB<SRORB>ENTHEN390                               LE
·480 IFB<256OR(B>40960ANDB<49152)ORB>53247THEN395      OB
·485 RETURN                                            HE
·490 REM ADDRESS TO HEX                                PM
·495 AC=AD:A=4096:GOSUB520                             AP
·500 A=256:GOSUB520                                    NF
·505 A=16:GOSUB520                                     LG
·510 A=1:GOSUB520                                      HE
·515 RETURN                                            JD
·520 T=INT(AC/A):IFT>9THENA$=CHR$(T+55):GOTO530        OC
·525 A$=CHR$(T+48)                                     JI
·530 PRINTA$;:AC=AC-A*T:RETURN                         AA
·535 A$="**SAVE**":GOSUB585                            IC
·540 OPEN1,T,1,A$:SYS680:CLOSE1                        AB
·545 IFST=0THENEND                                     FB
·550 GOSUB400:IFT=8THENGOSUB420                        PM
·555 GOTO535                                           FI
·560 A$="**LOAD**":GOSUB585                            PE
·565 OPEN1,T,0,A$:SYS690:CLOSE1                        PO
·570 IFST=64THEN195                                    OI
·575 GOSUB405:IFT=8THENGOSUB420                        CO
·580 GOTO560                                           GN
·585 PRINT" ":PRINTTAB(14)A$                           KA
·590 PRINT:A$="":INPUT"FILENAME";A$                    IO
·595 IFA$=""THEN590                                    HK
·600 PRINT:PRINT"TAPE OR DISK?":PRINT                  HL
·605 GETB$:T=1:IFB$="D"THENT=8:A$="@0:"+A$:RETURN      NP
·610 IFB$<>"T"THEN605                                  KO
·615 RETURN                                            PH
·620 B$="CONTINUE FROM ADDRESS":GOSUB430:AD=B          DD
·625 GOSUB475:IFB=0THEN620                             NK
·630 PRINT:GOTO195                                     HN
·635 B$="BEGIN SCAN AT ADDRESS":GOSUB430:AD=B          FK
·640 GOSUB475:IFB=0THEN635                             LN
·645 PRINT:GOTO670                                     HI
·650 FORB=0TO7:AC=PEEK(AD+B):GOSUB505:IFAD+B=ENTHENAD=SR:G
 OSUB410:GOTO195                                       LM
·655 PRINT" ";:NEXTB                                   LE
·660 PRINT:AD=AD+8                                     CD
·665 GETB$:IFB$=CHR$(136)THEN195                       JD
·670 GOSUB495:PRINT": ";:GOTO650                       KE
```

WIZARD TAG II
FROM PAGE 22

Starting address in hex: C000
Ending address in hex: CF55
SYS to start: 49152

Flankspeed **required for entry! See page 83.**

```
C000: 20 E5 CA 20 31 C8 20 B0 BB
C008: CB 20 05 C5 A9 00 8D 08 FD
C010: DC 20 03 C2 20 D0 C3 20 A7
C018: 25 C4 20 8E C5 20 E6 C5 43
C020: 20 2A C6 20 3C C0 20 AB 1A
C028: C1 20 F6 C7 AD 56 C0 D0 5E
C030: 27 AD 57 C0 F0 DB 4C 69 9F
C038: C1 00 00 00 EE 3A C0 AD 91
C040: 3A C0 D0 F8 EE 3B C0 AD 9D
C048: 3B C0 C9 0C D0 EE A9 00 83
C050: 8D 3B C0 60 00 00 00 00 3A
C058: AD 61 07 C9 B9 D0 03 4C 12
C060: 13 C1 38 AD 7E C0 E9 0A 4E
C068: 8D 7E C0 A2 00 BD 1F CF 84
C070: 9D 06 07 A9 02 9D 06 DB 46
C078: E8 E0 0C D0 F0 A9 6E 8D B5
C080: 3A C1 20 3B C1 CE 3A C1 64
C088: AD 3A C1 D0 F5 A2 00 BD 59
C090: 2B CF 9D 01 07 A9 01 9D 79
C098: 01 DB E8 E0 16 D0 F0 EE 06
C0A0: 61 07 AD 00 DC C9 6F F0 BD
C0A8: 0C 20 3C C0 20 E6 C5 20 BE
C0B0: F6 C7 4C A2 C0 A2 00 A9 6B
C0B8: 20 9D 01 07 E8 E0 16 D0 2F
C0C0: F8 AD 2C C4 C9 01 F0 0C 20
C0C8: CE D7 C3 CE 2C C4 CE 73 35
C0D0: C7 CE E0 C6 20 31 C8 20 49
C0D8: 68 CC 20 05 C5 A0 11 8C 37
C0E0: 0D C6 88 8C 16 C6 A9 00 50
C0E8: 8D 3A C1 AE 3A C1 BD 85 60
C0F0: CE 8D FF C0 BD 8D CE 8D B5
C0F8: 00 C1 A0 00 A9 A0 99 00 3F
C100: 04 C8 C0 02 D0 F8 EE 3A 82
C108: C1 AD 3A C1 C9 08 D0 DB F1
C110: 4C 0C C0 A2 00 BD 41 CF 9A
C118: 9D 5A 04 A9 01 9D 5A D8 8F
C120: E8 E0 14 D0 F0 AD 00 DC 4A
C128: C9 6F D0 03 4C 84 C1 20 E7
C130: E6 C5 C8 C0 00 D0 FB 4C 7F
C138: 25 C1 00 EE 58 07 AD 58 73
C140: 07 C9 BA F0 03 4C 62 C1 30
C148: A9 B0 8D 58 07 EE 57 07 DC
C150: AD 57 07 C9 B6 F0 03 4C 1D
C158: 62 C1 A9 B0 8D 57 07 EE B1
C160: 55 07 20 A7 C7 20 3C C0 69
C168: 60 A2 00 BD F3 CE 9D 59 E2
C170: 04 BD 09 CF 9D 81 04 A9 D7
C178: 01 9D 59 D8 9D 81 D8 E8 2A
C180: E0 16 D0 E7 A9 08 8D D7 47
C188: C3 8D 2C C4 8D 73 C7 8D 21
C190: E0 C6 A9 6E 8D 7E C0 A0 BD
C198: 11 8C 0D C6 88 8C 16 C6 FB
C1A0: AD 00 DC C9 6F D0 F9 4C 7B
C1A8: 00 C0 00 AD FF C1 18 85 76
C1B0: FB A9 60 69 00 85 FC AE 51
C1B8: 00 C2 E0 00 F0 10 A5 FB FE
C1C0: 18 69 80 85 FB A5 FC 69 50
C1C8: 00 85 FC CA D0 F0 A9 D1 53
C1D0: 85 02 A9 04 85 03 A2 0C 3D
C1D8: A0 15 B1 FB 91 02 88 10 68
C1E0: F9 18 A5 02 69 28 85 02 B3
C1E8: A5 03 69 00 85 03 18 A5 41
C1F0: FB 69 80 85 FB A5 FC 69 64
C1F8: 00 85 FC CA 10 DA 60 6A FB
C200: 42 00 60 AD 00 DC C9 7F 76
C208: F0 F8 8D 01 C2 C9 77 D0 55
C210: 31 AD FF C1 C9 6B D0 01 B7
C218: 60 A2 00 AD 00 C2 DD C2 2C
C220: C3 F0 06 E8 E0 0C D0 F3 75
C228: 60 EE FF C1 20 9D C3 AD 68
C230: F8 07 C9 E0 F0 06 A9 E0 5C
C238: 8D F8 07 60 A9 E1 8D F8 38
C240: 07 60 C9 7B D0 31 AD FF 9C
C248: C1 C9 01 D0 01 60 A2 00 A9
C250: AD 00 C2 DD C2 C3 F0 06 1C
C258: E8 E0 0C D0 F3 60 CE FF 22
C260: C1 20 9D C3 AD F8 07 C9 1B
C268: E2 F0 06 A9 E2 8D F8 07 5C
C270: 60 A9 E3 8D F8 07 60 C9 16
C278: 7D F0 03 4C 02 C3 AD 00 A9
C280: C2 C9 42 D0 01 60 C9 3C 87
C288: 90 03 4C CD C2 C9 36 90 89
C290: 03 4C DD C2 C9 30 90 03 0E
C298: 4C CD C2 C9 2A 90 03 4C 49
C2A0: DD C2 C9 24 90 03 4C CD DC
C2A8: C2 C9 1E 90 03 4C DD C2 D3
C2B0: C9 18 90 03 4C CD C2 C9 CC
C2B8: 12 90 03 4C DD C2 C9 0C 21
C2C0: 90 03 4C CD C2 C9 06 90 91
C2C8: 04 4C DD C2 60 AD FF C1 89
C2D0: C9 11 F0 15 C9 36 F0 11 B3
C2D8: C9 5B F0 0D 60 AD FF C1 CB
C2E0: C9 22 F0 05 C9 4A F0 01 C8
C2E8: 60 EE 00 C2 20 9D C3 AD 2A
C2F0: F8 07 C9 E4 F0 06 A9 E4 25
C2F8: 8D F8 07 60 A9 E5 8D F8 FC
C300: 07 60 C9 7E F0 03 4C 94 84
C308: C3 AD 00 C2 C9 00 D0 01 D7
C310: 60 C9 07 B0 03 4C 5F C3 64
C318: C9 0D B0 03 4C 6F C3 C9 EB
C320: 13 B0 03 4C 5F C3 C9 19 39
C328: B0 03 4C 6F C3 C9 1F B0 F4
C330: 03 4C 5F C3 C9 25 B0 03 45
C338: 4C 6F C3 C9 2B B0 03 4C AC
C340: 5F C3 C9 31 B0 03 4C 6F CD
C348: C3 C9 37 B0 03 4C 5F C3 30
C350: C9 3D B0 03 4C 6F C3 C9 54
```

```
C358: 43 B0 03 4C 5F C3 60 AD CC
C360: FF C1 C9 11 F0 15 C9 36 03
C368: F0 11 C9 5B F0 0D 60 AD 9B
C370: FF C1 C9 22 F0 05 C9 4A 28
C378: F0 01 60 CE 00 C2 20 9D 1A
C380: C3 AD F8 07 C9 E4 F0 06 97
C388: A9 E4 8D F8 07 60 A9 E5 94
C390: 8D F8 07 60 C9 6F D0 03 8B
C398: 20 2A C6 60 00 AD 9C C3 18
C3A0: F0 10 CE 9C C3 A9 80 8D 88
C3A8: 12 D4 A0 00 C8 C0 00 D0 8A
C3B0: FB 60 EE 9C C3 A9 81 8D 15
C3B8: 12 D4 A0 00 C8 C0 00 D0 9A
C3C0: FB 60 00 06 0C 12 18 1E 77
C3C8: 24 2A 30 36 3C 42 00 00 FB
C3D0: EE CE C3 AD CE C3 C9 08 64
C3D8: D0 46 A9 00 8D CE C3 AE 68
C3E0: CF C3 A9 20 9D 8A 69 9D 6D
C3E8: 8A 75 9D 8A 81 E8 8E CF D9
C3F0: C3 A9 2B 9D 8A 69 9D 8A 43
C3F8: 75 9D 8A 81 E0 6B D0 10 45
C400: A9 00 8D CF C3 A9 20 9D 32
C408: 8A 69 9D 8A 75 9D 8A 81 43
C410: AD F2 C3 C9 2B D0 06 EE 2F
C418: F2 C3 4C 20 C4 CE F2 C3 85
C420: 60 00 00 00 60 EE 23 C4 B7
C428: AD 23 C4 C9 08 D0 F5 A9 FF
C430: 00 8D 23 C4 A9 79 8D 65 BB
C438: C4 8D A4 C4 18 A9 D6 6D F9
C440: 21 C4 8D 64 C4 8D A3 C4 D2
C448: A9 6D 8D 68 C4 8D A7 C4 14
C450: 38 A9 A9 ED 21 C4 8D 67 A4
C458: C4 8D A6 C4 A9 00 8D 22 6F
C460: C4 A9 20 8D D6 79 8D A9 04
C468: 6D 18 AD 64 C4 69 80 8D 3C
C470: 64 C4 B0 03 4C 7A C4 EE C7
C478: 65 C4 18 AD 67 C4 69 80 7E
C480: 8D 67 C4 B0 03 4C 8B C4 8A
C488: EE 68 C4 EE 22 C4 AD 22 4A
C490: C4 C9 05 D0 CC CE A6 C4 FB
C498: EE A3 C4 A9 00 8D 22 C4 0E
C4A0: A9 29 8D D6 79 8D A8 6D F4
C4A8: 18 AD A3 C4 69 80 8D A3 F1
C4B0: C4 B0 03 4C B9 C4 EE A4 87
C4B8: C4 18 AD A6 C4 69 80 8D 26
C4C0: A6 C4 B0 03 4C CA C4 EE AA
C4C8: A7 C4 EE 22 C4 AD 22 C4 9F
C4D0: C9 05 D0 CC EE 21 C4 AD BF
C4D8: 21 C4 C9 1D D0 25 A9 00 45
C4E0: 8D 21 C4 A9 20 8D F3 79 19
C4E8: 8D 73 7A 8D F3 7A 8D 73 61
C4F0: 7B 8D F3 7B 8D 8C 6D 8D 7E
C4F8: 0C 6E 8D 8C 6E 8D 0C 6F 05
C500: 8D 8C 6F 60 00 A0 27 8C 3E
C508: F4 7B 8C 8A 6F C8 8C F5 4A
C510: 7B 8C 8B 6F A9 00 8D 04 4E
C518: C5 AE 04 C5 A9 8A 8D 33 4B
C520: C5 BD 87 C5 8D 34 C5 AD 26
C528: 1B D4 C9 67 B0 F9 A8 A2 3F
C530: 27 8A 99 8A 78 C8 E8 E0 11
C538: 29 D0 F6 18 A5 A2 69 0A FC
C540: C5 A2 D0 FC EE 04 C5 AD DC
C548: 04 C5 C9 06 D0 CB AE 1B 48
C550: D4 E0 68 B0 F9 A0 3A 98 8C
C558: 20 83 C5 E8 C8 98 20 83 AF
C560: C5 18 AD 84 C5 69 7F 8D AC
C568: 84 C5 C8 98 20 83 C5 E8 66
C570: C8 98 20 83 C5 20 BA C8 DE
C578: A9 00 8D 04 C5 A9 0A 8D BA
C580: 84 C5 60 9D 0B 63 60 84 1C
C588: 7E 78 72 6C 66 00 AD 09 7B
C590: DC 29 0F 8D 8D C5 C9 00 50
C598: D0 04 8D 97 C5 60 8D 97 DD
C5A0: C5 CE 58 07 AD 58 07 C9 6B
C5A8: AF F0 01 60 A9 B9 8D 58 F3
C5B0: 07 CE 57 07 AD 57 07 C9 BA
C5B8: AF F0 01 60 A9 B5 8D 57 FE
C5C0: 07 CE 55 07 AD 55 07 C9 C6
C5C8: AF F0 01 60 A9 00 8D 0B 0D
C5D0: DC A9 B0 8D 54 07 8D 55 D3
C5D8: 07 8D 57 07 8D 58 07 EE A7
C5E0: 57 C0 60 00 00 00 EE E4 2D
C5E8: C5 AD E4 C5 C9 02 D0 39 DC
C5F0: A9 00 8D E4 C5 AD E5 C5 2C
C5F8: D0 18 EE E5 C5 AE E3 C5 D4
C600: BD CD CD 8D 00 D4 BD 29 A2
C608: CE 8D 01 D4 A9 11 8D 04 86
C610: D4 60 CE E5 C5 A9 10 8D 07
C618: 04 D4 EE E3 C5 AD E3 C5 E0
C620: C9 5C D0 05 A9 00 8D E3 37
C628: C5 60 A0 00 B9 C2 C3 CD FC
C630: 00 C2 F0 05 C8 C0 0C D0 4F
C638: F3 B9 CE C7 8D 4A C6 18 33
C640: AD FF C1 69 89 8D 49 C6 40
C648: AD 00 60 C9 26 B0 01 60 58
C650: C9 27 D0 03 4C 8A C6 C9 7C
C658: 28 D0 03 4C 8A C6 C9 29 E4
C660: D0 03 4C C2 C6 C9 2A D0 CE
C668: 03 4C C2 C6 C9 2B D0 03 0A
C670: 4C 57 C7 C9 2C D0 03 4C F1
C678: 57 C7 C9 3C D0 03 4C 92 50
C680: C7 C9 3D D0 03 4C 92 C7 C9
C688: 60 00 AD 4A C6 8D 9B C6 97
C690: A9 8A 8D 9A C6 A0 00 A9 FD
C698: 20 99 00 60 C8 C0 6C D0 79
C6A0: F8 AE 89 C6 BD 85 CE 8D 38
C6A8: B6 C6 BD 8D CE 8D B7 C6 4C
C6B0: A0 27 A2 00 98 9D 00 60 B1
C6B8: C8 E8 E0 02 D0 F6 EE 89 8D
C6C0: C6 60 A9 E0 8D F8 07 A9 A9
C6C8: 00 8D 91 C7 20 25 C4 20 D9
C6D0: 8E C5 AD 21 C4 C9 00 F0 73
C6D8: 45 EE 91 C7 AD 91 C7 C9 37
C6E0: 08 D0 E9 EE F8 07 AD F8 39
C6E8: 07 C9 E5 D0 05 A9 E0 8D 8D
C6F0: F8 07 AD 00 C2 C9 30 F0 4C
```

```
C6F8: 06 CE FF C1 4C 02 C7 EE 94
C700: FF C1 20 AB C1 20 F6 C7 2E
C708: 20 8E C5 AD 21 C4 C9 00 D9
C710: F0 0C 20 3C C0 20 A7 C7 B9
C718: 20 E6 C5 4C C7 C6 A9 E2 4C
C720: 8D F8 07 EE F8 07 AD F8 43
C728: 07 C9 E7 D0 05 A9 E2 8D D0
C730: F8 07 20 3C C0 20 E6 C5 1A
C738: 20 A7 C7 20 F6 C7 20 AB 72
C740: C1 20 8E C5 EE 00 C2 AD D5
C748: 00 C2 C9 42 D0 D5 20 AB 89
C750: C1 A9 E6 8D F8 07 60 A9 3A
C758: E6 8D F8 07 A9 00 8D 91 95
C760: C7 20 D0 C3 20 8E C5 AD FE
C768: CF C3 F0 24 EE 91 C7 AD 07
C770: 91 C7 C9 08 D0 EB EE FF 47
C778: C1 20 AB C1 20 F6 C7 AD 54
C780: CF C3 F0 0C 20 3C C0 20 4E
C788: E6 C5 20 A7 C7 4C 5C C7 35
C790: 60 00 AD 89 C6 C9 08 F0 B1
C798: 01 60 A0 41 8C 0D C6 88 C4
C7A0: 8C 16 C6 EE 56 C0 60 A9 1A
C7A8: 21 8D 12 D4 8D 0E D4 A2 51
C7B0: 00 E8 8E 0F D4 E0 00 D0 BD
C7B8: F8 A9 40 8D 12 D4 E8 E0 D9
C7C0: 00 D0 FB A9 00 8D 0E D4 A7
C7C8: A9 03 8D 0F D4 60 63 66 11
C7D0: 69 6C 6F 72 75 78 7B 7E 70
C7D8: 81 84 D1 F9 21 49 71 99 20
C7E0: C1 E9 11 39 61 89 B1 D8 4C
C7E8: D8 D9 D9 D9 D9 D9 D9 DA B7
C7F0: DA DA DA DA 09 00 A9 00 0F
C7F8: 8D F5 C7 AE F5 C7 BD DA 49
C800: C7 8D 10 C8 BD E7 C7 8D 29
C808: 11 C8 A2 00 AD F4 C7 9D 8C
C810: D1 D8 E8 E0 16 D0 F8 EE 53
C818: F5 C7 AD F5 C7 C9 0D D0 E8
C820: DA EE F4 C7 AD F4 C7 C9 DA
C828: 10 D0 05 A9 09 8D F4 C7 0B
C830: 60 A2 00 BD 25 C9 9D 00 7D
C838: 38 BD E5 C9 9D C0 38 BD 32
C840: A5 CA 9D 80 39 E8 E0 C0 92
C848: D0 E9 A2 00 BD FA C8 9D C4
C850: 00 D0 E8 E0 2B D0 F5 A9 86
C858: 00 8D 21 C4 8D 22 C4 8D CD
C860: CF C3 8D CE C3 8D 04 C5 6B
C868: 8D E3 C5 8D 56 C0 8D E4 B6
C870: C5 8D 23 C4 8D 8D C5 8D 1A
C878: E5 C5 8D 89 C6 8D 54 C0 A4
C880: 8D 55 C0 8D 9C C3 8D 91 31
C888: C7 8D 57 C0 8D F5 C7 8D CE
C890: 0B DC 8D 0C DC 8D 0D DC 66
C898: A9 6A 8D FF C1 A9 42 8D 75
C8A0: 00 C2 A9 09 8D F4 C7 A9 0A
C8A8: E0 8D F8 07 A2 00 BD E1 59
C8B0: C8 9D 00 D4 E8 E0 19 D0 9F
C8B8: F5 60 A2 00 BD C8 C8 9D 9E
C8C0: 00 D4 E8 E0 19 D0 F5 60 9F
C8C8: 00 00 00 04 00 09 09 00 DE
C8D0: 00 00 00 00 05 05 00 03 DD
C8D8: 00 02 80 01 01 00 00 00 5D
C8E0: 0F 00 00 00 00 00 00 00 EF
C8E8: 00 00 00 00 00 00 00 80 69
C8F0: 80 00 00 80 00 00 00 00 F1
C8F8: 00 8F A4 85 00 00 00 00 B2
C900: 00 00 00 00 00 00 00 00 00
C908: 00 00 00 1B 00 00 00 01 24
C910: D8 00 1D 00 00 00 01 00 07
C918: 00 00 0B 00 06 0A 01 09 3D
C920: 07 0A 00 07 07 00 00 00 3F
C928: 00 FE 00 03 F8 00 03 AA D0
C930: 00 03 A8 00 00 A0 00 00 7C
C938: A0 00 00 50 00 01 50 00 7A
C940: 01 50 00 06 50 00 01 50 39
C948: 00 01 D0 00 01 50 00 00 6B
C950: 50 00 00 14 00 00 54 00 09
C958: 01 50 00 02 10 00 02 90 4E
C960: 00 00 28 00 00 00 00 00 88
C968: 00 00 00 00 FE 00 03 F8 63
C970: 00 03 AA 00 03 A8 00 00 C9
C978: A0 00 00 A0 00 00 50 00 0A
C980: 01 50 00 01 50 00 06 54 7D
C988: 00 01 56 00 01 50 00 01 32
C990: 50 00 01 50 00 05 14 00 4B
C998: 14 05 00 50 01 00 40 01 44
C9A0: 00 A0 02 80 00 00 00 00 C3
C9A8: 02 FC 00 00 BF 00 02 AB 15
C9B0: 00 00 AB 00 00 28 00 00 84
C9B8: 28 00 00 14 00 00 15 00 0A
C9C0: 00 15 00 00 15 80 00 15 80
C9C8: 00 00 15 00 00 15 00 00 F2
C9D0: 14 00 00 50 00 00 54 00 89
C9D8: 00 15 00 00 12 00 00 1A 1A
C9E0: 00 00 A0 00 00 00 00 00 81
C9E8: 00 00 00 02 FC 00 00 BF A7
C9F0: 00 02 AB 00 00 AB 00 00 4A
C9F8: 28 00 00 28 00 00 14 00 5D
CA00: 00 15 00 00 15 00 00 55 7F
CA08: 80 02 55 00 00 15 00 00 F4
CA10: 15 00 00 15 00 00 51 40 CB
CA18: 01 40 50 01 00 14 01 00 BF
CA20: 04 0A 00 28 00 00 00 00 56
CA28: 00 3C 00 00 FF 00 00 FF 64
CA30: 34 00 FF 14 00 3C 14 00 C8
CA38: 15 14 00 55 50 01 55 00 5D
CA40: 01 15 00 01 75 00 00 55 22
CA48: 00 00 55 00 00 55 00 00 F2
CA50: 51 00 00 41 00 00 43 00 26
CA58: 00 42 00 00 40 00 00 C0 9B
CA60: 00 00 80 00 00 00 3C 00 1D
CA68: 00 FF 00 00 FF 00 00 FF 68
CA70: 00 00 3C 00 00 14 00 00 C0
CA78: 15 00 00 55 40 01 55 50 C9
CA80: 01 15 10 01 55 10 00 75 82
CA88: 10 00 55 30 00 55 00 00 73
CA90: 45 00 00 41 00 00 C1 00 D8
```

```
CA98: 00 81 00 00 01 00 00 03 1E
CAA0: 00 00 02 00 00 00 00 00 A2
CAA8: 00 00 00 00 00 00 00 00 A8
CAB0: 00 00 00 00 00 00 00 00 B0
CAB8: 00 00 00 00 00 00 00 00 B8
CAC0: 00 00 00 00 00 00 00 00 C0
CAC8: 00 00 00 00 20 00 00 A0 89
CAD0: 16 08 A8 40 08 E9 55 54 73
CAD8: E9 55 80 E9 55 56 F1 40 60
CAE0: 52 01 58 00 00 AD 0E DC 25
CAE8: 29 FE 8D 0E DC A5 01 29 59
CAF0: FB 85 01 A2 00 BD 00 D0 A4
CAF8: 9D 00 30 E8 E0 00 D0 F5 57
CB00: EE F7 CA EE FA CA AD FA 0F
CB08: CA C9 37 D0 E6 A9 30 8D F2
CB10: FA CA A9 D0 8D F7 CA A5 46
CB18: 01 09 04 85 01 AD 0E DC 45
CB20: 09 01 8D 0E DC A2 00 BD 03
CB28: 40 CB 9D 18 31 E8 E0 50 35
CB30: D0 F5 A2 00 BD 90 CB 9D 51
CB38: D0 31 E8 E0 20 D0 F5 60 4B
CB40: 60 6A 55 60 60 6A 55 60 41
CB48: 06 A6 56 06 06 A6 56 06 5A
CB50: AA AA AA 55 A6 A6 A6 55 EE
CB58: 9A 9A 9A 55 AA AA AA 55 D2
CB60: 00 FC CF CC FC 00 00 00 F6
CB68: 00 00 FF 33 33 03 00 00 D1
CB70: 7F DF F7 F7 F7 F7 DF 7F 0F
CB78: FD F7 DF DF DF DF F7 FD E3
CB80: 00 00 00 00 00 00 AA FF 2B
CB88: 00 00 00 00 00 28 BE C3 33
CB90: 00 0E 3B 2E 3F 15 5D 55 0F
CB98: 00 E0 B8 EC FC 54 75 55 3B
CBA0: 16 16 3F 35 3D 0F 0F 03 9F
CBA8: 94 94 FC 5C 7C F0 F0 C0 4A
CBB0: A9 99 20 D2 FF A9 93 20 44
CBB8: D2 FF A2 00 A9 A0 9D A8 BE
CBC0: 04 9D D8 06 A9 07 9D A8 38
CBC8: D8 9D D8 DA E8 E0 18 D0 A5
CBD0: EB A2 00 A9 A0 9D D0 04 1C
CBD8: 9D E7 04 9D 98 05 9D AF EA
CBE0: 05 9D 10 06 9D 27 06 A9 0E
CBE8: 07 9D D0 D8 9D E7 D8 9D 33
CBF0: 98 D9 9D AF D9 9D 10 DA 13
CBF8: 9D 27 DA 18 8A 69 28 AA 77
CC00: E0 C8 D0 CF A2 00 BD 95 40
CC08: CE 9D 00 04 A9 03 9D 00 C2
CC10: D8 E8 E0 28 D0 F0 A2 00 3F
CC18: BD BD CE 9D 2B 07 BD CF BF
CC20: CE 9D 53 07 BD E1 CE 9D F2
CC28: 7B 07 A9 02 9D 2B DB 9D 98
CC30: 53 DB 9D 7B DB E8 E0 12 30
CC38: D0 DE A2 00 A9 01 9D 54 27
CC40: DB E8 E0 05 D0 F8 8D 61 A3
CC48: DB A2 00 BD 85 CE 8D 5C C2
CC50: CC BD 8D CE 8D 5D CC A9 98
CC58: A0 A0 00 99 43 05 C8 C0 05
CC60: 02 D0 F8 E8 E0 08 D0 E3 B2
CC68: A2 00 A9 20 9D 00 60 E8 BB
CC70: E0 00 D0 F8 EE 6E CC AD F2
CC78: 6E CC C9 92 D0 EA A9 60 D5
CC80: 8D 6E CC A2 00 A9 25 9D 58
CC88: 00 60 9D 00 85 9D 00 86 30
CC90: 9D 00 87 E8 A9 26 9D 00 0C
CC98: 60 9D 00 85 9D 00 86 9D DD
CCA0: 00 87 E8 E0 00 D0 DE A2 44
CCA8: 00 A9 25 9D 00 61 E8 A9 09
CCB0: 26 9D 00 61 E8 E0 80 D0 F0
CCB8: F0 EE B3 CC EE B3 CC EE 77
CCC0: B3 CC EE AD CC EE AD CC 14
CCC8: EE AD CC AD AD CC C9 88 AC
CCD0: D0 D5 A9 61 8D B3 CC 8D 1E
CCD8: AD CC A9 00 8D 55 CF AE 5E
CCE0: 55 CF BD 95 CD 8D FF CC 81
CCE8: 8D 04 CD BD B1 CD 8D 00 13
CCF0: CD 8D 05 CD EE 04 CD A9 89
CCF8: 00 8D 56 CF A9 23 8D 00 07
CD00: 60 A9 24 8D 00 60 18 AD E1
CD08: FF CC 69 80 8D FF CC B0 C9
CD10: 03 4C 17 CD EE 00 CD AD AE
CD18: FF CC 8D 04 CD EE 04 CD 05
CD20: AD 00 CD 8D 05 CD EE 56 41
CD28: CF AD 56 CF C9 04 D0 CC 37
CD30: EE 55 CF AD 55 CF C9 1C FC
CD38: D0 A5 A9 00 8D 55 CF 18 23
CD40: A9 80 6D 55 CF 8D 5C CD B4
CD48: 18 A9 F6 6D 55 CF 8D 5F 80
CD50: CD A9 61 8D 5D CD 8D 60 CF
CD58: CD A9 25 8D 80 61 8D F5 E7
CD60: 61 18 AD 5C CD 69 80 8D 29
CD68: 5C CD B0 03 4C 72 CD EE C1
CD70: 5D CD 18 AD 5F CD 69 80 78
CD78: 8D 5F CD B0 03 4C 83 CD 84
CD80: EE 60 CD AD 60 CD C9 85 C8
CD88: 90 CF EE 55 CF AD 55 CF CF
CD90: C9 0A D0 AB 60 1A 3F 64 FE
CD98: 2B 53 1A 3F 64 2B 53 1A 6D
CDA0: 3F 64 2B 53 1A 3F 64 2B AB
CDA8: 53 1A 3F 64 2B 53 1A 3F 91
CDB0: 64 64 64 64 67 67 6A 6A E5
CDB8: 6A 6D 6D 70 70 70 73 73 36
CDC0: 76 76 76 79 79 7C 7C 7C 8C
CDC8: 7F 7F 82 82 82 68 8F 8F D6
CDD0: 8F 8F 00 18 8F 1F D1 D2 5B
CDD8: 8F 18 00 8F 00 C3 D2 18 BE
CDE0: 8F 18 00 8F 8F 8F D2 D2 DC
CDE8: 00 00 68 8F 8F 8F 8F 00 8F
CDF0: 18 8F 1F D1 D2 8F 18 00 04
CDF8: 8F C3 D2 18 8F 18 8F 8F FD
CE00: 68 8F 68 8F 68 8F 68 8F DF
CE08: 68 8F 68 8F 68 D1 00 D1 04
CE10: C3 D1 C3 D2 C3 D2 8F 30 92
CE18: 8F 00 D2 00 C3 D1 C3 D2 A6
CE20: C3 D2 8F 30 8F 00 D2 00 D8
CE28: D2 09 0A 0C 0A 0C 00 0E 3E
CE30: 0C 15 12 0F 0C 0E 00 0C 98
```

```
CE38: 00 10 0F 0E 0C 0E 00 0C 8B
CE40: 0A 0C 0F 0F 00 00 09 0A 87
CE48: 0C 0A 0C 00 0E 0C 15 12 AB
CE50: 0F 0C 0E 00 0C 10 0F 0E B2
CE58: 0C 0E 0C 0A 09 0A 09 0A AE
CE60: 09 0A 09 0A 09 0A 09 0A AC
CE68: 09 12 00 12 10 12 10 0F D6
CE70: 10 0F 0C 0B 0C 00 0F 00 C1
CE78: 10 12 10 0F 10 0F 0C 0B EF
CE80: 0C 00 0F 00 0F 43 93 E3 65
CE88: 33 63 B3 03 53 05 05 05 38
CE90: 06 05 05 06 06 A0 A0 A0 8E
CE98: A0 A0 A0 A0 97 89 9A 81 58
CEA0: 92 84 A0 94 81 87 A0 89 20
CEA8: 89 A0 AD A0 94 88 85 A0 64
CEB0: 93 85 91 95 85 8C A0 A0 44
CEB8: A0 A0 A0 A0 A0 A0 94 89 9A
CEC0: 8D 85 92 A0 20 20 20 20 87
CEC8: A0 8C 85 96 85 8C A0 A0 65
CED0: B0 B2 BA B3 B0 A0 20 20 34
CED8: 20 20 A0 A0 A0 B1 A0 A0 ED
CEE0: A0 A0 A0 A0 A0 A0 A0 A0 E5
CEE8: 20 20 20 20 A0 A0 A0 A0 EB
CEF0: A0 A0 A0 20 19 0F 15 20 50
CEF8: 12 01 0E 20 0F 15 14 20 92
CF00: 0F 06 20 14 09 0D 05 21 85
CF08: 20 10 12 05 13 13 20 06 9B
CF10: 09 12 05 20 14 0F 20 07 9A
CF18: 0F 20 01 07 01 09 0E 01 68
CF20: 04 04 09 0E 07 20 20 14 9A
CF28: 09 0D 05 10 12 05 13 13 90
CF30: 20 06 09 12 05 20 20 17 CD
CF38: 08 05 0E 20 12 05 01 04 8F
CF40: 19 21 20 17 05 20 08 01 DF
CF48: 16 05 20 01 20 17 09 0E D2
CF50: 0E 05 12 20 21 00 B6
```

DATA EXPRESS

FROM PAGE 28

```
•10 REM *** DATA EXPRESS *** BUCK CHILDRE
 SS ***                                   KF
•20 REM *** P.O. BOX 13575 SALEM, OR 9730
 9 ***                                    OA
•30 PRINTCHR$(147)"LOADING AND CHECKING D
 ATA LINE:"                               NN
•40 S=53000:J=S:REM *** CHANGE S TO RELOC
 ATE ***                                  EL
•50 FORB=0TO11:READA                      PL
•60 IFB=0THENL=PEEK(64)*256+PEEK(63):PRIN
 TCHR$(19)TAB(31)L:PRINT                  EL
•70 IFA<0ORA>255THEN90                    EN
•80 POKEJ+B,A:X=X+A:NEXTB:READA:IFA=XTHEN
 100                                      DM
•90 PRINT"ERROR IN DATA LINE:"L:END       CI
•100 X=0:J=J+12:D=D+1:IFD<20THEN50        LE
•110 K=S+40:HI=INT(K/256):LO=K-(HI*256):P
 OKES+8,LO:POKES+10,HI                    MH
•120 PRINT"THE DATA IS OK[3"."]":PRINT    PF
•130 PRINT"SYS"S"TO USE[3"."]":END        AM
•140 DATA169,79,32,210,255,169,78,162,48,
 160,207,236,1805                         JK
•150 DATA0,3,208,14,204,1,3,208,9,162,139
 ,160,1111                                NP
•160 DATA227,169,70,32,210,255,32,210,255
 ,142,0,3,1605                            EL
•170 DATA140,1,3,96,173,0,2,201,83,240,3,
 76,1018                                  LJ
•180 DATA139,227,32,121,0,240,248,201,34,
 208,244,164,1858                         FF
•190 DATA122,200,132,251,164,123,132,252,
 32,115,0,201,1724                        AD
•200 DATA0,240,228,201,44,240,224,201,34,
 208,241,165,2026                         AD
•210 DATA122,56,229,251,240,111,201,17,14
 4,2,169,16,1558                          GA
•220 DATA133,253,169,255,133,2,32,115,0,1
 84,80,98,1454                            IP
•230 DATA192,0,208,83,224,1,240,4,224,8,2
 08,75,1467                               OC
•240 DATA134,254,184,80,81,134,63,132,64,
 32,121,0,1279                            NN
•250 DATA201,44,208,59,184,80,76,196,64,1
 44,55,208,1519                           GG
•260 DATA6,228,63,144,49,240,47,232,208,7
 ,200,208,1632                            PM
•270 DATA4,162,255,160,255,134,65,132,66,
 169,1,166,1569                           ML
•280 DATA254,160,0,32,186,255,165,253,166
 ,251,164,252,2138                        ON
•290 DATA32,189,255,169,63,166,65,164,66,
 32,216,255,1672                          FG
•300 DATA76,116,164,162,11,44,162,14,44,1
 62,8,76,1039                             MK
•310 DATA58,164,32,121,0,240,240,201,44,2
 08,236,32,1576                           FA
•320 DATA115,0,32,138,173,32,247,183,166,
 20,164,21,1291                           LC
•330 DATA230,2,165,2,240,130,201,1,240,14
 3,208,155,1717                           ND
```

COMPUTERS IN CONTROL

FROM PAGE 32

LED DRIVER

```
•1 REM================================== NM
•2 REM          LED DRIVER               CG
•3 REM        RUPERT REPORT #43          MB
•4 REM  USE CASSETTE PORT MOTOR OUTPUT   BG
•5 REM          TO LIGHT LED             HJ
```

```
•6 REM================================== CL
•10 REM ====== INITIALIZATION ========== JA
•20 DEF FNS(B)=PEEK(M) OR 2[UPARROW]B
    :REM  SET BIT B OF LOCATION M        HL
•30 DEF FNC(B)=PEEK(M) AND NOT 2[UPARROW]
 B  :REM  CLEAR BIT B OF LOCATION M      BA
•40 M=0 : POKE M,FNS(4) :REM SET DDR FOR
  BIT 4 TO BE OUTPUT                     HA
•50 M=1 : POKE M,FNC(4) :REM CLEAR BIT 4
  OF $1 SO $192 IS NOT CLEARED BY IRQ    AA
•60 POKE 192,1          :REM SET $192 SO
  IRQ DOES NOT TURN MOTOR ON             LG
•70 PK=PEEK(1) : L1=PK AND NOT 32 : L0=PK
  OR 32  :REM  ON AND OFF POKE VALUES    NC
•80 DF=.50     :REM DUTY FACTOR = 50%    NC
•90 K=2.5 : P=10[UPARROW]K : W1=DF*P : W0
 =P-W1    :REM INITIAL PERIOD AND PULSE W
 IDTHS                                   PN
•95 PRINT "[CLEAR]" : GOSUB 2000 :REM GRA
 PH                                      KF
•100 REM ====== MAIN LOOP =============== IP
•110 IF DF=0 THEN 130                    JE
•120 POKE 1,L1 : FOR N=1 TO W1: NEXT     KO
•130 GET A$ : IF A$<>"" THEN GOSUB 1000  DF
•140 IF DF=1 THEN 120                    NI
•150 POKE 1,L0 : FOR N=1 TO W0 : NEXT    NO
•160 GET A$ : IF A$<>"" THEN GOSUB 1000  GL
•170 GOTO 110                            MC
•1000 REM ====== KEYBOARD INPUT ========= OG
•1010 REM  +  INCREASES FREQUENCY        MH
•1020 REM  -  DECREASES FREQUENCY        NN
•1030 REM 1-9 = DUTY FACTOR (10 TO 90%)  JI
•1040 REM 0 = TOGGLE DUTY FACTOR (0/100%) CE
•1050 REM                                KP
•1060 IF VAL(A$)>0 THEN DF=0.1*VAL(A$) :
  REM  1 TO 9 SELECTED                   EM
•1070 IF A$="0" THEN DF=-1*(DF=0) :  REM
  TOGGLE 0 OR 1                          NM
•1080 IF A$="-" THEN K=K+.5 :IF K>3.5 THE
 N K=3.5  : REM INCREASE PERIOD          OH
•1090 IF A$="+" THEN K=K-.5 :IF K<.5 THEN
  K=.5 :REM DECREASE PERIOD/INCREASE FREQ FG
•1100 P=10[UPARROW]K              :REM GET
 PERIOD                                  OE
•1110 W1=DF*P : W0=P-W1 :REM PULSE WIDTHS NO
•1120 GET A$ : IF A$<>"" THEN 1060 : REM
  ANY MORE KEYS?                         GD
•1130 GOSUB 2000  :REM  DISPLAY BAR GRAPH OL
•1140 RETURN                             AG
•2000 REM ======= BARGRAPHS ============= NI
•2010 PRINT"[HOME]"; : FOR N=1 TO 33 : PR
 INT"[c V]"; : NEXT : PRINT              IE
•2020 PRINT"DUTY FACTOR: "; : GOSUB 2100 PF
•2025 IF DF=0 THEN PRINT"0";  : GOTO 2040 FF
•2030 FOR N=1 TO DF*10+.1 : PRINT "[c U][
 c U]"; : NEXT                           IL
•2040 PRINT : PRINT"FREQUENCY  : "; : GOS
 UB 2100                                 HO
•2050 FOR N=1 TO 10-3*(K-.5)             BK
•2060 PRINT"[c O][c O]"; : NEXT          GJ
•2070 RETURN                             KM
•2100 FOR N=1 TO 20 : PRINT" "; : NEXT   DN
•2110 FOR N=1 TO 20 : PRINT"[LEFT]"; : NE
 XT                                      NO
•2120 RETURN                             NO
•2990 REM ====== DUTY FACTOR DEMO ======= LG
•2991 REM > ADD LINE 99 GOTO 3000        AH
•2992 REM > RAPIDLY MOVE THE LED         GH
•2993 REM   BACK AND FORTH.              OI
•2994 REM > LOOK AT THE RELATIVE WIDTHS  FG
•2995 REM   OF LIGHT AND DARK STREAKS    BM
•2996 REM   AS THE DUTY FACTOR CHANGES.  OI
•2997 REM =============================== NB
•3000 P0=9 : P1=1 : GOSUB 3050           DC
•3010 P0=5 : P1=5 : GOSUB 3050           EE
•3020 P0=1 : P1=9 : GOSUB 3050           GG
•3030 GOTO 3000                          CN
•3050 FOR CT=1 TO 50                     OE
•3060 POKE 1,L0 : FOR N=1 TO P0 : NEXT   DM
•3070 POKE 1,L1 : FOR N=1 TO P1 : NEXT   FA
•3080 NEXT : RETURN                      FL
```

LED.MON

```
1 REM ===================================
2 REM            LED.MON
3 REM         RUPERT REPORT #43
4 REM  ---------C64 AND C128------------
5 REM  CONTINUOUSLY VARY DUTY CYCLE
6 REM  OF LED DRIVEN BY MOTOR OUTPUT
7 REM  OF CASSETTE PORT.
9 REM ===================================
100 . 01400  00         ...  ;ON TIME
110 . 01401  01         ...  ;OFF TIME
115 ;PREPARE MOTOR OUTPUT :
116 ;  SET BIT 4 OF $0 (DDR) FOR OUTPUT
117 ;  CLEAR BIT 4 OF $1
118 ;  PUT 1 INTO $192 TO KEEP MOTOR OFF
120 . 01402  A5 00    LDA $00
130 . 01404  09 10    ORA #%0001 0000
140 . 01406  85 00    STA $00
150 . 01408  A5 01    LDA $01
160 . 0140A  29 EF    AND #%1110 1111
170 . 0140C  85 01    STA $01
180 . 0140E  A9 01    LDA #$01
190 . 01410  8D 92 01 STA $0192
194 ;===== MAIN LOOP ===================
195 ;TURN LED ON (CLEAR BIT 5 OF $1)
200 . 01413  A5 01    LDA $01
210 . 01415  29 DF    AND #%1101 1111
220 . 01417  85 01    STA $01
225 ;GET 'ON' DELAY VALUE, DECREMENT IT
226 ;THEN CALL 'PAUSE' SUBROUTINE
230 . 01419  AC 00 14 LDY $1400
240 . 0141C  CE 00 14 DEC $1400
250 . 0141F  20 3A 14 JSR $143A
255 ;TURN LED OFF (SET BIT 5 OF $1)
```

```
260 . 01422  A5 01     LDA $01
270 . 01424  09 20     ORA #%0010 0000
280 . 01426  85 01     STA $01
285 ;GET 'OFF' DELAY VALUE, DECREMENT IT
286 ;THEN CALL 'PAUSE' SUBROUTINE
290 . 01428  AC 01 14 LDY $1401
300 . 0142B  EE 01 14 INC $1401
310 . 0142E  20 3A 14 JSR $143A
315 ;CALL 'GETIN' TO SEE IF ANY KEY
316 ;HAS BEEN PRESSED.  EXIT ON ANY KEY.
317 ;REPEAT MAIN LOOP OTHERWISE.
320 . 01431  20 E4 FF JSR $FFE4
330 . 01434  F0 DD     BEQ $1413
340 . 01436  60        RTS
345 ;======= END MAIN LOOP ============
350 . 01437  EA        NOP
360 . 01438  EA        NOP
370 . 01439  EA        NOP
375 ;PAUSE SUBROUTINE : LOOP Y TIMES
380 . 0143A  88        DEY
390 . 0143B  D0 FD     BNE $143A
400 . 0143D  60        RTS
```

LED.BAS

```
•100 REM=================================== DE
•110 REM              LED.BAS               NH
•120 REM         RUPERT REPORT #42          DJ
•130 REM            FOR C128/C64            MD
•140 REM=================================== JM
•150 PRINT"LOADING [3"."]"                  AJ
•160 M=5120 :REM $1400 INITIAL ADDRESS <<   GL
•170 READ B$                                JE
•180 IF B$="XX" THEN 240                    KP
•185 IF DS$="" THEN GOSUB 500 : GOTO 200
 :REM C64 ONLY                              FB
•190 B=INPUT(B$) :REM C128 ONLY             EP
•200 CK=CK+B  :REM CHECKSUM                 JG
•210 POKE M,B                               CL
•220 M=M+1                                  PL
•230 GOTO 170                               AA
•240 IF CK<>5824 THEN PRINT"DATA ERROR" :
 STOP                       :REM <<<<<<<    GD
•250 PRINT"PROGRAM IS LOADED"               JF
•260 SYS 5122 :REM $1402 START ADDRESS <<   MH
•270 END                                    IP
•500 REM --LINES 500-600 FOR C64 ONLY----   EB
•510 REM      CONVERT HEX TO DECIMAL        GH
•520 MS$=LEFT$(B$,1)                        FH
•530 LS$=RIGHT$(B$,1)                       EN
•540 MS=VAL(MS$)                            DK
•550 IF MS$>="A" THEN MS=ASC(MS$)-55        GO
•560 LS=VAL(LS$)                            FM
•570 IF LS$>="A" THEN LS=ASC(LS$)-55        GN
•580 B=MS*16+LS                             DO
•590 RETURN                                 NO
•600 REM ---------------------------------  KL
•5120 DATA 00, 01, A5, 00, 09, 10, 85, 00 DM
•5128 DATA A5, 01, 29, EF, 85, 01, A9, 01 MO
•5136 DATA 8D, 92, 01, A5, 01, 29, DF, 85 AD
•5144 DATA 01, AC, 00, 14, CE, 00, 14, 20 JH
•5152 DATA 3A, 14, A5, 01, 09, 20, 85, 01 EF
•5160 DATA AC, 01, 14, EE, 01, 14, 20, 3A NA
•5168 DATA 14, 20, E4, FF, F0, DD, 60, EA PO
•5176 DATA EA, EA, 88, D0, FD, 60         JH
•5183 DATA XX                             IF
```

OPTICAL OSCILLATOR

```
•1 REM ================================== GN
•2 REM      OPTICAL OSCILLATOR            MD
•3 REM        RUPERT REPORT #43           MB
•4 REM  -------C64 AND C128------         ND
•5 REM > DRIVE LED FROM MOTOR OUTPUT      HN
•6 REM (PIN C-3) OF CASSETTE PORT.        NN
•7 REM > READ CADMIUM SULPHIDE PHOTOCELL  LG
•8 REM FROM BUTTON A INPUT (PIN 6) OF     PL
•9 REM JOYSTICK CONTROL PORT 2.           HM
•10 REM ================================= PC
•20 POKE 0,PEEK(0) OR 2[UPARROW]4     :REM
 SET DDR SO BIT 4 OF ADDRESS 1 IS AN OUT
PUT.                                      HM
•30 POKE 1,PEEK(1) AND NOT 2[UPARROW]4 :R
EM CLEAR BIT 4 OF ADDRESS 1               AA
•40 POKE 192,1:REM SET $192 TO KEEP MOTOR
 OFF                                      FP
•50 L1=PEEK(1) AND NOT 2[UPARROW]5 :REM L
ED ON                                     GB
•60 L0=PEEK(1) OR 2[UPARROW]5       :REM L
ED OFF                                    NP
•70 IF (PEEK(56320) AND 16)=16 THEN POKE
 1,L1 :PRINT "ON",                        NE
•80 IF (PEEK(56320) AND 16)= 0 THEN POKE
 1,L0 :PRINT "OFF",                       JO
•90 GOTO 70                               EP
```

128 SCROLLER
FROM PAGE 24

128 SCROLLER BASIC

```
•1 DATA"A019B032C020D[3"0"]E003F144G251H2
53I096J141K224L005M145N173O177P202Q200R2
40"                                       FP
•2 DATA"S004T006U220V169W204X238Y002Z076[
133[EP]040]136[UPARROW]172[BACKARROW]174
:255;018<024=165>175"                     BC
•3 DATA"?208@225 001!164#176$223%236&252'
254(007)056*105+134-142.197/198[PI]"      MK
•4 DATA"Z8,A[5"D"]JEA-SA140,LAIJTA-(ANSA2
01,25,FLV<JSANEA205,SAF10,VDJEAV<JSAN"    FE
•5 DATA"TA201,[EP]FLV39,JTANLA205,TAFLVDJ
LAVS[&V216,['162,D+G+HB186,C[BACKARROW](
AKE?EZ89,"                                AE
```

```
·6 DATA"CK R48,KY?EZ23,C[BACKARROW]EAB161
 ,CQOG]MGQOH]MHQWTAFXB>CBPABUAB;CF221,R21
 9,I[BACKARROW]EA"                              MO
·7 DATA"[UPARROW]TAB!C]OGQMG]OHQMH]WLA?XB
 >CBPABUAB;CF218,R216,IJKC=G<*[EP][GFY230
 ,&NKCIJ"                                       HA
·8 DATA"KC=H<*[EP][HFY230,'NKCIJKC=G)233,
 [EP][G#Y/&NKCIJKC=H)233,[EP][H#Y/'NKCI23
 2,%SA"                                         MH
·9 DATA"I[UPARROW]LA[BACKARROW]EAB!CBPAOG
 BXAMGBPABUAOHBDCMHBUAB;CF@B>CBXABDCP%EAR
 Y#242,QWTAF199,"                               EH
·10 DATA"R.IBWCXEA[BACKARROW]EA[UPARROW]L
 AB!CBXAOGBPAMGBXABDCOHBUAMHBDCB;CF@R$B>C
 BPABUAP%EA?244,"                               MI
·11 DATA"QWTAF199,R.I[UPARROW]LAOGJ$COHJ@
 CIN$CMGN@CMHI160,DWEAF IBPABUAQZ188,C[UP
 ARROW]EAWSAF"                                  ID
·12 DATA" IBPABUAQZ207,C[4"D"]Z214,CBRRDD
 :D:D:D:D:D:D:D:D:D:DHD:D:D:D:D:D:D:D:D"        OB
·13 DATA"[PI]"                                  NC
·14 DIMB(96):GOSUB15:END                        HE
·15 READD$:FORI=1TOLEN(D$)STEP4:DE$=MID$(
 D$,I,4):D1$=LEFT$(DE$,1)                       JG
·16 IFD1$="[PI]"THEN18                          GC
·17 D2$=RIGHT$(DE$,3):B(ASC(D1$))=VAL(D2$
 ):NEXT:GOTO15                                  FG
·18 N$="128SCROLLER":OPEN15,8,15,"S:"+N$:
 OPEN1,8,1,"0:"+N$+",P,W"                       OO
·19 PRINT#1,CHR$(000)CHR$(019);                 GE
·20 READB$:FORA=1TOLEN(B$):A$=MID$(B$,A,1
 ):IFA$=","THENB=VAL(C$):C$="":GOTO24           GG
·21 IFA$<":"ANDA$>"/"THENC$=C$+A$:NEXT          GC
·22 IFA$="[PI]"THEN25                           AN
·23 B=B(ASC(A$))                                CC
·24 C=C+B:PRINT#1,CHR$(B);:NEXT:GOTO20          LI
·25 IFC<> 58713 THENPRINT"CHECK FOR TYPIN
 G ERROR":GOTO27                                PK
·26 PRINTN$" SAVED TO DISK"                     AH
·27 CLOSE1:CLOSE15:RETURN                       OB
```

FAST SHUFFLE

```
·1 BLOAD"128SCROLLER                            CB
·2 FORI=0TO255:READA:POKE3584+I,A:NEXT          KE
·3 CLR:A$="[RVSON][5" "]":B$="[c 6][c 5][
 GREEN][PURPLE][CYAN][PURPLE][c 1][c 2]":
 D$="[HOME][21"[DOWN]"][40" "]":E$="[3"[R
 IGHT]"]":DIMD(32)                              FL
·4 C$="[DOWN][4"[RIGHT]"]PRESS [1] FOR HA
 RD, [2] FOR EASY[HOME]"                        BJ
·5 PRINTCHR$(147);:FORI=0TO19STEP5:FORK=0
 TO7:C$(K)=MID$(B$,K+1,1):NEXT:FORJ=0TO39
 :PRINTC$(JAND7)A$;:NEXT:NEXT                   FN
·6 GOSUB9:PRINTC$                               AE
·7 DO UNTILA1$<>"":A=INT(RND(0)*2)*5:B=A+
 14:C=INT(RND(0)*6)*5:D=C+14:E=INT(RND(0)
 *4):N=INT(RND(0)*4)*5+5                        HK
·8 FORI=1TON:SYS4864,A,B,C:SYS4882,D,E:NE
 XT:GETA1$:LOOP:SP=1:X=36:Y=60:FORI=1TO4:
 MOVSPRI,X,Y:SPRITEI,0:NEXT:SPRITE1,1,3,0
 ,0,0,0:GOTO13                                  BC
·9 FORI=1TO32:D(I)=I:NEXT:FORJ=0TO32:K=IN
 T(RND(TI)*32)+1:L=INT(RND(TI)*32)+1:D(0)
 =D(L):D(L)=D(K):D(K)=D(0):NEXT                 FM
·10 K=0:PRINT"[HOME][WHITE]";:FORI=1TO32:
 K=K+1:PRINTRIGHT$(STR$(D(I)),2)E$;             CK
·11 IFK>7THENK=0:PRINT"[4"[DOWN]"]";            BH
·12 NEXT:RETURN                                 FD
·13 IFA1$=>"2"THENA1$="2":ELSEA1$="1"           CM
·14 MO=(VAL(A1$)-1)*40:PRINTD$                  GL
·15 GETKEYA$:IFA$=CHR$(17)THENGOSUB22:REM
 DOWN                                           BK
·16 IFA$=CHR$(29)THENGOSUB24:REMRIGHT           BD
·17 IFA$=CHR$(145)THENGOSUB26:REMUP             KP
·18 IFA$=CHR$(157)THENGOSUB28:REMLEFT           BA
·19 IFA$=CHR$(32)THENGOSUB30:REMMOVE            PI
·20 IFA$=CHR$(42)THENGOSUB37:REMROTATE          IC
·21 GOTO15                                      AJ
·22 Y=Y+40:IFY>(180+MO)THENY=60                 KA
·23 GOSUB39:RETURN                              NI
·24 X=X+40:IFX>316THENX=36                      PM
·25 GOSUB39:RETURN                              OC
·26 Y=Y-40:IFY<60THENY=(180+MO)                 CD
·27 GOSUB39:RETURN                              NM
·28 X=X-40:IFX<36THENX=316                      FD
·29 GOSUB39:RETURN                              NG
·30 IFSP=2ORSP=4THENA=0:B=(19+(MO/8)):C=(
 X-36)/8:D=C+4                                  OI
·31 IFSP=1ORSP=3THENC=0:D=39:A=(Y-60)/8:B
 =A+4                                           EP
·32 IFSP=1THENE=1                               PO
·33 IFSP=3THENE=0                               PK
·34 IFSP=2THENE=2                               PC
·35 IFSP=4THENE=3                               PI
·36 FORI=0TO4:SYS4864,A,B,C:SYS4882,D,E:N
 EXT:RETURN                                     JM
·37 IFSP=0THENSP=1:ELSESPRITESP,0:SP=SP+1
 :IFSP>4THENSP=1                                ME
·38 SPRITESP,1,3,0,0,0,0:RETURN                 MC
·39 FORI=1TO4:MOVSPRI,X,Y:NEXT:RETURN           MA
·40 DATA0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,2
 52,0,7,248,0,15,255,254,63,255,255,223,2
 54,0,191,255,0,223,252,0,191,254,0,223,2
 52,0,223,248,0,224,0,0,255,0,0,254,0,0         IP
·41 DATA252,0,0,248,0,0,0,0,0,0                 AO
·42 DATA 0,0,0,2,0,0,7,0,0,7,0,0,7,0,0,7,
 0,0,7,0,0,7,224,0,7,254,0,15,255,0,111,2
 55,128,63,255,128,63,255,0,31,255,0,31,2
 54,0,15,254,0,15,254,0,0,0,0,31,254,0          HE
·43 DATA31,255,0,31,254,0,0                     KA
·44 DATA 0,0,0,0,0,0,0,0,0,0,63,0,0             BP
·45 DATA 31,192,127,255,224,255,255,248,1
 27,255,254,0,127,254,0,255,254                 HM
·46 DATA 0,127,254,0,127,255,0,63,255,0,3
 1,255,0,7,247,0,0,31,0,0,255,0,0,127,0,0
 ,63,0,0,63,0,0,63,0                            AB
```

IMPORTANT! Letters on white background are **Bug Repellent** line codes. **Do not enter them!** Pages 81 and 82 explain these codes and provide other essential information on entering ***Ahoy!*** programs. Refer to these pages **before** entering any programs!

```
·47 DATA 15,254,0,15,254,0,15,255,0,0,0,0
 ,31,254,0,63,254,0,127,255,0,255,255,128
 ,255,255,64,255,255,96,255,254,96,255,25
 5,192,255,255,0,63,252,0,60,0,0          NK
·48 DATA60,0,0,60,0,0,60,0,0,60,0,0,60,0,
 0,24,0,0,0                               IG
```

PLINK & PLONK
FROM PAGE 15

```
·5 REM"[7" "]PLINK AND PLONK 3.0                        BL
·6 REM"[7" "]BY WALTER E. MEYERS                        AG
·10 GOTO 100                                            CD
·20 LN=21:COL=5:GOSUB 50:PRINT PL$(PL):RE
 TURN                                                   AO
·30 SYS 49188:C=(PEEK(V)-8)/40:R=(PEEK(V+
 1)-64)/24:RETURN                                       EH
·35 COL=3+((C3-1)*5):LN=5+((R3-1)*3):GOTO
  50                                                    ED
·40 LN=10:COL=29                                        BB
·50 POKE 781,LN:POKE 782,COL:POKE 783,0:S
 YS 65520:RETURN                                        HF
·60 FOR I=S TO S+24:POKE I,0:NEXT:RETURN                BK
·70 POKE S+24,15:POKE S+5,45:POKE S+6,165
 :POKE S+4,33:POKE S+1,6:POKE S,5                       HM
·75 FOR T=1TO200:NEXT:POKE S+4,32:RETURN                FB
·80 POKES+15,HN(P):POKES+1,LN(P):POKES+4,
 19:FOR T=1TO30:NEXT:POKE S+4,18:RETURN                 BN
·99 REM ---------------------- INITIALIZE               FG
·100 PRINT"[CLEAR][3"[DOWN]"][3"[RIGHT]"]
 ONE MOMENT.":FOR I=3 TO 6:POKE 52213+I,I
 :NEXT:H1=24:V1=50                                      JK
·110 H2=255:V2=200:V=53248:POKE V+2,H1:PO
 KE V+3,V1:POKE V+4,H2:POKE V+5,V2                      AM
·120 POKE V+39,4:POKE V+40,13:POKE V+41,7
 :POKE V+42,1:POKE V+23,6:POKE V+29,7                   FL
·130 S=54272:BL=30:TEMPO=3:DIM B$(17),PO(
 8,8),HU$(2),FF$(5),PL$(7)                              ML
·140 READ A:IF A=-99 THEN 180                           FP
·150 GOTO 140                                           LD
·180 SPRITE=49344                                       FC
·190 FOR J=1 TO 4:FOR I=SP TO SP+63:READ
 A:POKE I,A:NEXT:SP=SP+64:NEXT                          AL
·200 JOY=49152                                          HB
·210 READ A:IF A=999 THEN 230                           DH
·220 POKE JOY,A:JOY=JOY+1:GOTO 210                      HF
·230 POKE 56334,PEEK(56334) AND 254:POKE
 1,PEEK(1) AND 251:SYS 49152                            IA
·240 POKE 1,PEEK(1) OR 4:POKE 56334,PEEK(
 56334) OR 1                                            NG
·250 READ A:IF A=999 THEN 270                           FL
·260 FOR I=0 TO 7:READ B:POKE 61440+(A*8)
 +I,B:NEXT:GOTO 250                                     FC
·270 POKE 56576,(PEEK(56576) AND 252):POK
 E 53272,44:POKE 648,200:PRINT"[CLEAR][WH
 ITE]"                                                  GC
·280 POKE 53281,11:POKE 53280,11:GOTO 400
 0                                                      NL
·899 REM ---------------------- DRAW GRID               AM
·900 PRINT"[CLEAR][WHITE][3"[DOWN]"]":FOR
 J=1TO5:FOR I=1TO5:PO(J,I)=0:NEXT:NEXT                  NC
·910 FOR I=1TO16:PRINTTAB(2) B$(I):NEXT:L
 N=3:COL=30:FOR J=1TO2:FOR I=1TO2                       PH
·920 GOSUB 50:PRINT HU$(I) "[6"[s Q]"]":L
 N=LN+1:NEXT:NEXT:PS(1)=12:PS(2)=12                     LL
·999 REM ------------------ PLACEMENT SEG               GM
·1000 PC(1)=7:PC(2)=13:POKE 52216,3:FOR J
 =1TO12:FOR P=1TO2:POKE V+21,0                          JH
·1010 POKE V+39,PC(P):POKE V,128:POKE V+1
 ,136:POKE V+21,1:PL=P                                  HK
·1020 GOSUB 20:GOSUB 30                                 BP
·1030 IF PO(R,C)<>0 THEN GOSUB 40:PRINT M
 $(1):GOSUB 70:GOTO 1020                                AD
·1040 IF R=3 AND C=3 THEN GOSUB 40:PRINT
 M$(3):GOSUB 70:GOTO 1020                               JD
·1050 PO(R,C)=P:COL=3+((C-1)*5):LN=5+((R-
 1)*3):GOSUB 80:GOSUB 50:PRINT FF$(P)                   LO
·1060 GOSUB 40:PRINT M$(0):LN=2+(INT(J/7)
 )+P:COL=BL:IF J>6 THEN LN=LN+1                         LJ
·1070 IF COL>35 THEN COL=30:BL=30                       PO
·1080 GOSUB 50:PRINT" ":NEXT:BL=BL+1:NEXT
 :LN=22:COL=0:GOSUB 50:PRINT BL$:P=2                    FB
·1090 LN=21:COL=0:GOSUB 50:PRINT BL$:LN=2
 2:COL=8:GOSUB 50:PRINT"[WHITE]AND NOW--"
 ;                                                      MJ
·1100 FOR T=1TO500:NEXT:PRINT "THE FUN BE
 GINS!":FOR T=1TO1000:NEXT                              GG
·1110 LN=22:COL=0:GOSUB 50:PRINT BL$                    JA
·1189 :                                                 OD
·1190 P=3-P:Q=3-P                                       DE
·1199 REM -------------------- FROM WHERE               LE
·1200 PL=P+2:GOSUB 20:PRINTTAB(10) PL$(7)
 :POKE V+21,0                                           MD
·1210 POKE 52216,3:POKE V+29,1:POKE V+39,
 PC(P):POKE V+21,1                                      AC
·1220 GOSUB 30:C1=C:R1=R                                BM
·1230 IF PO(R1,C1)<>P THEN GOSUB 40:PRINT
 M$(2):GOSUB 70:GOTO 1220                               GH
·1240 POKE V+21,0:POKE 52216,6:POKE V+29,
 0:POKE V+21,1:PO(R1,C1)=0:C3=C1:R3=R1                  PA
·1250 GOSUB 35:PRINT FF$(3):GOSUB 40:PRIN
 T M$(0)                                                NO
·1299 REM ---------------------- TO WHERE               EC
·1300 PL=P+4:GOSUB 20:PRINTTAB(10)PL$(7)                CC
·1310 GOSUB 30:C2=C:R2=R                                JP
·1320 IF PO(R2,C2)<>0 THEN GOSUB 40:PRINT
 M$(1):GOSUB 70:GOTO 1370                               DD
·1330 IF R2=R1 AND C2=C1 THEN GOSUB 40:PR
 INT M$(4):GOSUB 70:GOTO 1370                           CM
·1340 IF ABS(R2-R1)>1ORABS(C2-C1)>1 THEN
```

```
GOSUB 40:PRINT M$(5):GOSUB 70:GOTO 1370 MD
•1350 PO(R2,C2)=P:C3=C2:R3=R2:GOSUB 35:PR
 INT FF$(P):POKE V+21,0:GOSUB 80 AB
•1360 GOSUB 40:PRINT M$(0):GOTO 2000 JP
•1370 PO(R1,C1)=P:C3=C1:R3=R1:GOSUB 35:PR
 INT FF$(P):GOTO 1210 CC
•1999 REM ------------ CHECK FOR CAPTURES ON
•2000 IF PO(R2-1,C2-1)<>Q THEN 2050 NA
•2010 IF PO(R2-2,C2-2)=P THEN X=R2-1:Y=C2
 -1:GOSUB 2500:GOTO 2050 AK
•2020 IF PO(R2-2,C2-2)=0 THEN 2050 JJ
•2030 IF PO(R2-3,C2-3)=P THEN X=R2-1:Y=C2
 -1:GOSUB 2500:X=R2-2:Y=C2-2:GOSUB 2500 DB
•2049 : ED
•2050 IF PO(R2-1,C2)<>Q THEN 2100 AM
•2060 IF PO(R2-2,C2)=P THEN X=R2-1:Y=C2:G
 OSUB 2500:GOTO 2100 GO
•2070 IF PO(R2-2,C2)=0 THEN 2100 NA
•2080 IF PO(R2-3,C2)=P THEN X=R2-1:Y=C2:G
 OSUB 2500:X=R2-2:Y=C2:GOSUB 2500 MG
•2099 : HF
•2100 IF PO(R2-1,C2+1)<>Q THEN 2150 DF
•2110 IF PO(R2-2,C2+2)=P THEN X=R2-1:Y=C2
 +1:GOSUB 2500:GOTO 2150 GI
•2120 IF PO(R2-2,C2+2)=0 THEN 2150 AK
•2130 IF PO(R2-3,C2+3)=P THEN X=R2-1:Y=C2
 +1:GOSUB 2500:X=R2-2:Y=C2+2:GOSUB 2500 JH
•2149 : KH
•2150 IF PO(R2,C2-1)<>Q THEN 2200 CB
•2160 IF PO(R2,C2-2)=P THEN X=R2:Y=C2-1:G
 OSUB 2500:GOTO 2200 HF
•2170 IF PO(R2,C2-2)=0 THEN 2200 BF
•2180 IF PO(R2,C2-3)=P THEN X=R2:Y=C2-1:G
 OSUB 2500:Y=C2-2:GOSUB 2500 OI
•2199 : NJ
•2200 IF PO(R2,C2+1)<>Q THEN 2250 PN
•2210 IF PO(R2,C2+2)=P THEN X=R2:Y=C2+1:G
 OSUB 2500:GOTO 2250 PE
•2220 IF PO(R2,C2+2)=0 THEN 2250 ED
•2230 IF PO(R2,C2+3)=P THEN X=R2:Y=C2+1:G
 OSUB 2500:Y=C2+2:GOSUB 2500 ON
•2249 : AL
•2250 IF PO(R2+1,C2-1)<>Q THEN 2300 NG
•2260 IF PO(R2+2,C2-2)=P THEN X=R2+1:Y=C2
 -1:GOSUB 2500:GOTO 2300 HJ
•2270 IF PO(R2+2,C2-2)=0 THEN 2300 MF
•2280 IF PO(R2+3,C2-3)=P THEN X=R2+1:Y=C2
 -1:GOSUB 2500:X=R2+2:Y=C2-2:GOSUB 2500 JJ
•2299 : DN
•2300 IF PO(R2+1,C2)<>Q THEN 2350 FM
•2310 IF PO(R2+2,C2)=P THEN X=R2+1:Y=C2:G
 OSUB 2500:GOTO 2350 DI
•2320 IF PO(R2+2,C2)=0 THEN 2350 NF
•2330 IF PO(R2+3,C2)=P THEN X=R2+1:Y=C2:G
 OSUB 2500:X=R2+2:GOSUB 2500 NI
•2349 : HA
•2350 IF PO(R2+1,C2+1)<>Q THEN 2400 DH
•2360 IF PO(R2+2,C2+2)=P THEN X=R2+1:Y=C2
 +1:GOSUB 2500:GOTO 2400 DL
•2370 IF PO(R2+2,C2+2)=0 THEN 2400 JO
•2380 IF PO(R2+3,C2+3)=P THEN X=R2+1:Y=C2
 +1:GOSUB 2500:X=R2+2:Y=C2+2:GOSUB 2500 CD
•2398 : KB
•2399 REM ----------- CHECK FOR GAME END GH
•2400 IF PS(Q)>1 THEN 1190 HD
•2410 LN=21:COL=3:GOSUB 50:PRINT BL$:LN=2
 2:GOSUB 50:PRINT BL$:LN=21:GOSUB 50 AA
•2420 PRINT "[c 8]THAT'S IT--PLAYER" P "W
 INS!":POKE V+21,0:POKE V,255:POKE V+1,18
 0 CE
•2430 POKE V+23,1:POKE V+29,1:POKE V+39,P
 C(P):IF P=1 THEN POKE 52216,5:GOTO 2450 HK
•2440 POKE 52216,4 IF
•2450 POKE V+21,1:LN=22:COL=0:GOSUB 50:PR
 INT "[WHITE]  ANOTHER GAME?  HIT [YELLOW
 ]Q[WHITE] TO "; EB
•2455 PRINT "QUIT, OR ANY":PRINTTAB(7) "O
 THER KEY TO PLAY AGAIN.":POKE 198,0 DK
•2460 GET AG$:IF AG$="" THEN 2460 NA
•2470 IF AG$<>"Q" AND AG$<>"[s Q]" THEN P
 OKE V+21,0:POKE V+23,0:GOTO 900 HD
•2480 POKE V+21,0:PRINT "[CLEAR]":POKE 53
 272,21:POKE 648,4:POKE 56576,PEEK(56576)
  OR 3 FD
•2490 PRINT "[CLEAR][c 7]":POKE SC,6:POKE
  BO,14:NEW:CLR:END FC
•2500 PO(X,Y)=0:COL=3+((Y-1)*5):LN=5+((X-
 1)*3):GOSUB 50:PRINT FF$(Q+3) AF
•2510 FOR T=1TO200:NEXT:GOSUB 50:PRINT FF
 $(3) LA
•2520 PS(Q)=PS(Q)-1:RETURN LA
•2998 : PL
•2999 REM ------------------------ TITLE MD
•3000 RESTORE:PRINT"[CLEAR]":GOSUB 60:CC=
 0:POKE S+24,15:POKE S+5,47:POKE S+6,136:
 P=4 IM
•3010 POKE V+21,6:LN=10:COL=4:GOSUB 50 IL
•3020 PRINT"[YELLOW]" P$L$I$N$K$ "[RVSOFF
 ][DOWN][WHITE] AND [UP][c 6]" P$L$O$N$K$ KK
•3030 READ HI,LO,DUR:P=6-P:IF HI<0 THEN 3
 100 FF
•3040 A1=INT(RND(1)*(255-24)+24):A2=INT(R
 ND(1)*(200-50)+50):POKE V+P,A1 IB
•3050 POKE V+P+1,A2:POKE S+4,19:POKE S+15
 ,HI:POKE S+1,LO:FOR T=1TO DUR*TEMPO JL
•3060 NEXT:POKE S+4,18:REST=DUR/2:FOR T=1
  TO REST*TEMPO:NEXT:CC=CC+1 OG
•3070 IF CC=27 THEN RESTORE:GOTO 3030 BD
•3080 IF CC<52 THEN 3030 LB
•3090 FOR I=1 TO 2:READ HI,LO,DUR:NEXT:GO
 TO 3030 DK
•3100 POKE S+24,15:POKE S+5,47:POKE S+6,1
 36:POKE V+21,0:GOTO 900 CK
•3999 REM ---------------------- STRINGS PJ
•4000 P$="[RVSON][c A][s Q][s I][DOWN][3"
 [LEFT]"][c Q][s Q][s K][DOWN][3"[LEFT]"]
```

```
[s S][RIGHT][RIGHT][UP][UP]":L$="[RVSON]
[s A][DOWN][LEFT][s B][DOWN][LEFT][c Z][
s C][UP][UP]":O$="[RVSON][s U][s Q][s I]
[DOWN][3"[LEFT]"][s B][RIGHT][s B][DOWN]
[3"[LEFT]"][s J
][s Q][s K][UP][UP]"                        FA
•4010 N$="[RVSON][c A][s Q][s I][DOWN][3"
[LEFT]"][s B][RIGHT][s B][DOWN][3"[LEFT]
"][s S][RIGHT][s S][UP][UP]":K$="[RVSON]
[s A][RIGHT][s A][DOWN][3"[LEFT]"][c Q][
s Q][c J][DOWN][3"[LEFT]"][s S][RIGHT][s
 S][UP][UP]":I$="[RVSON][s A][DOWN][LEFT
][s B][DOWN][LE
FT][s S][UP][UP]"                           FF
•4020 B$(1)="[BLACK][c A][4"[s *]"][c R][
4"[s *]"][c R][4"[s *]"][c R][4"[s *]"][
c R][4"[s *]"][c S]":B$(2)="[s -][4" "][
s -][4" "][s -][4" "][s -][4" "][s -][4"
 "][s -]"                                   BM
•4040 FOR I=3 TO 15:B$(I)=B$(2):NEXT:
B$(4)="[c Q][4"[s *]"][s +][4"[s *]"][s
+][4"[s *]"][s +][4"[s *]"][s +][4"[s *]
"][c W]"                                    GH
•4050 FOR I=7 TO 13 STEP 3:B$(I)=B$(4):NE
XT:B$(8)="[s -][4" "][s -][4" "][s -][RV
SON][4" "][RVSOFF][s -][4" "][s -][4" "]
[s -]"                                      CJ
•4060 B$(9)=B$(8):B$(16)="[c Z][4"[s *]"]
[c E][4"[s *]"][c E][4"[s *]"][c E][4"[s
 *]"][c E][4"[s *]"][c X][WHITE]":HU$(1)
="[YELLOW]":HU$(2)="[c 6]"                  PD
•4100 M$(0)= "[10" "][DOWN][10"[LEFT]"][1
0" "][DOWN][10"[LEFT]"][10" "]"             HF
•4110 M$(1)="[WHITE]SOMEONE'S [DOWN][10"[
LEFT]"]THERE NOW.[DOWN][10"[LEFT]"]TRY A
GAIN."                                      PH
•4120 M$(2)="[WHITE]YOU DON'T [DOWN][10"[
LEFT]"]HAVE ONE  [DOWN][10"[LEFT]"]THERE
.[4" "]"                                    CM
•4130 M$(3)="[WHITE]FORBIDDEN [DOWN][10"[
LEFT]"]ZONE![5" "][DOWN][10"[LEFT]"]TRY
AGAIN."                                     IL
•4140 M$(4)="[WHITE]YOU BEGAN [DOWN][10"[
LEFT]"]THERE.[4" "][DOWN][10"[LEFT]"]TRY
 AGAIN."                                    HI
•4150 M$(5)="[WHITE]CAN'T MOVE[DOWN][10"[
LEFT]"]THAT FAR! [DOWN][10"[LEFT]"]TRY A
GAIN."                                      EK
•4160 FF$(1)="[YELLOW][RVSON]!#$%[DOWN][4
"[LEFT]"]&'()":FF$(2)="[c 6][RVSON]*+,-[
DOWN][4"[LEFT]"]:;<=":FF$(3)="[4" "][DOW
N][4"[LEFT]"][4" "]"                        MF
•4170 FF$(4)="[c 8][RVSON]!#$%[DOWN][4"[L
EFT]"][s L][s M][s N][s O]":FF$(5)="[c 8
][RVSON]*+,-[DOWN][4"[LEFT]"][s V][s W][
s X][s Z]"                                  NP
•4180 BL$="[38" "]"                         DD
•4200 PL$(1)="[YELLOW]PLAYER 1: [WHITE]PL
```

```
ACE A [YELLOW]PLINK.":PL$(2)="[c 6]PLAYE
R 2: [WHITE]PLACE A [c 6]PLONK."            MM
•4210 PL$(3)="[YELLOW]PLAYER 1: [WHITE]PI
CK A [YELLOW]PLINK, [WHITE]THEN  "          JO
•4220 PL$(4)="[c 6]PLAYER 2: [WHITE]PICK
A [c 6]PLONK, [WHITE]THEN  "                FM
•4230 PL$(5)="[YELLOW]PLAYER 1: [WHITE]MA
KE YOUR MOVE, AND ":PL$(6)="[c 6]PLAYER
2:"                                         GP
•4240 PL$(7)="[WHITE]HIT THE FIRE BUTTON.
":HN(1)=67:HN(2)=56:LN(1)=56:LN(2)=99       MO
•4990 GOTO 3000                             NN
•4999 REM ------------------------ MUSIC    OO
•5000 DATA 67,15,16,33,135,8,37,162,8,37,
162,8,42,62,8,42,62,8,44,193,8,56,99,16     KA
•5001 DATA 28,49,8,29,221,8,29,221,8,31,1
65,8,31,165,8,33,135,8,44,193,16            LE
•5002 DATA 25,30,8,29,223,8,44,193,16,25,
30,8,29,223,8,44,193,8,42,62,8,42,62,8      IL
•5003 DATA 37,162,8,37,162,8,33,135,8,33,
135,8,29,223,8,28,49,8,25,29,8,22,96,16     BO
•5004 DATA 0,0,0,0,0,0,-1,-1,-99            HN
•5099 REM ---------------------- SPRITES    DJ
•5100 DATA 255,255,0,255,255,0,192,3        GH
•5101 DATA 0,192,3,0,192,3,0,192            FJ
•5102 DATA 3,0,192,3,0,192,3,0              IO
•5103 DATA 192,3,0,192,3,0,192,3            FI
•5104 DATA 0,192,3,0,192,3,0,192            FM
•5105 DATA 3,0,192,3,0,192,3,0              AP
•5106 DATA 192,3,0,192,3,0,255,255          MD
•5107 DATA 0,255,255,0,0,0,0,0              NA
•5109 :                                     EC
•5110 DATA 0,0,0,0,255,0,7,24               JO
•5111 DATA 224,30,102,120,63,255,252,112    NC
•5112 DATA 24,14,119,153,238,254,24,127     JP
•5113 DATA 252,24,63,204,24,51,192,24       CM
•5114 DATA 3,255,255,255,71,231,226,112     JH
•5115 DATA 0,14,63,195,252,31,231,248       FC
•5116 DATA 7,255,224,0,255,0,0,0            GF
•5117 DATA 0,0,0,0,0,0,0,0                  DK
•5119 :                                     EM
•5120 DATA 0,0,0,0,255,0,7,255              BL
•5121 DATA 224,31,255,248,56,63,236,96      CB
•5122 DATA 30,14,79,28,126,252,152,207      BB
•5123 DATA 252,216,31,231,251,231,199,255   MO
•5124 DATA 227,195,255,195,72,0,18,118      PB
•5125 DATA 24,110,63,24,252,31,255,248      LN
•5126 DATA 7,255,224,0,255,0,0,0            HA
•5127 DATA 0,0,0,0,0,0,0,0                  GD
•5129 :                                     FH
•5130 DATA 255,128,0,204,223,0,204,223      ID
•5131 DATA 224,204,192,248,204,192,60,0     OE
•5132 DATA 120,30,112,204,14,224,204,7      FK
•5133 DATA 224,204,7,224,120,7,224,6        IJ
•5134 DATA 103,224,6,103,112,6,110,120      PF
•5135 DATA 3,206,60,1,128,31,0,31           EO
•5136 DATA 7,255,152,0,255,159,0,0          BK
•5137 DATA 24,0,0,31,0,0,0,0                AE
```

IMPORTANT! Letters on white background are **Bug Repellent** line codes. **Do not enter them!** Pages 81 and 82 explain these codes and provide other essential information on entering ***Ahoy!*** programs. Refer to these pages **before** entering any programs!

```
•5199 REM ------ CHAR TRANSFER, JOYSTICK  PO
•5200 DATA 169,0,133,251,133,253,169,208  CH
•5201 DATA 133,252,169,240,133,254,162,16 JN
•5202 DATA 160,0,177,251,145,253,136,208  CL
•5203 DATA 249,230,252,230,254,202,208,24
0                                         KG
•5204 DATA 96,0,0,0,173,0,220,41          HO
•5205 DATA 15,201,14,240,20,201,13,240    CM
•5206 DATA 33,201,11,240,46,201,7,240     EL
•5207 DATA 59,173,0,220,41,16,208,228     CK
•5208 DATA 96,56,173,1,208,201,112,144    DO
•5209 DATA 219,233,24,141,1,208,76,136    DF
•5210 DATA 192,0,24,173,1,208,201,184     CM
•5211 DATA 176,202,105,24,141,1,208,76    FH
•5212 DATA 136,192,0,56,173,0,208,201     CB
•5213 DATA 88,144,185,233,40,141,0,208    EC
•5214 DATA 76,136,192,0,24,173,0,208      CJ
•5215 DATA 201,208,176,168,105,40,141,0   BG
•5216 DATA 208,76,136,192,0,0,0,0         FN
•5217 DATA 162,200,160,0,200,208,253,202  MG
•5218 DATA 208,248,76,36,192,999          DC
•5299 REM ------------------- CUSTOM FONT EE
•5300 DATA 161,0,0,1,7,14,12,31,31        BM
•5301 DATA 163,31,127,255,131,1,241,201,2
05                                        FN
•5302 DATA 164,248,254,255,254,224,199,14
0,129                                     ON
•5303 DATA 165,0,0,128,224,240,240,248,24
8                                         NI
•5304 DATA 166,30,28,12,12,7,1,0,0        DI
•5305 DATA 167,127,127,63,128,97,241,127,
31                                        HP
•5306 DATA 168,190,254,252,1,134,143,254,
248                                       HC
•5307 DATA 169,120,56,48,48,224,128,0,0   EL
•5308 DATA 170,0,0,1,7,15,15,31,31        JC
•5309 DATA 171,31,113,204,255,1,121,225,1
93                                        HH
•5310 DATA 172,248,142,51,255,128,158,135
,131                                      AI
•5311 DATA 173,0,0,128,224,240,240,248,24
8                                         OB
•5312 DATA 186,28,28,15,12,7,1,0,0        FM
•5313 DATA 187,193,1,255,126,0,252,126,31 PA
•5314 DATA 188,131,128,255,126,0,63,126,2
48                                        AL
•5315 DATA 189,56,56,240,48,224,128,0,0   BL
•5316 DATA 193,0,0,0,60,60,60,60,60       GK
•5317 DATA 194,60,60,60,60,60,60,60,60    IB
•5318 DATA 195,0,0,0,252,252,0,0,0        PF
•5319 DATA 201,0,0,0,240,248,124,60,60    CN
•5320 DATA 202,60,60,62,31,15,0,0,0       IB
•5321 DATA 203,60,60,124,248,240,0,0,0    JF
•5322 DATA 204,30,28,13,15,7,1,0,0        IF
•5323 DATA 205,127,240,199,128,63,255,127
,31                                       CG
•5324 DATA 206,190,15,227,1,252,255,254,2
48                                        DL
•5325 DATA 207,120,56,176,240,224,128,0,0 JH
•5326 DATA 209,0,0,0,255,255,0,0,0        DN
•5327 DATA 211,60,60,60,60,60,0,0,0       AK
•5328 DATA 213,0,0,0,15,31,62,60,60       DH
•5329 DATA 214,28,28,15,12,7,1,0,0        EF
•5330 DATA 215,193,1,255,120,243,243,120,
31                                        NL
•5331 DATA 216,131,128,255,30,207,207,30,
248                                       MP
•5332 DATA 218,56,56,240,48,224,128,0,0   CP
•5333 DATA 235,60,60,60,63,63,60,60,60    HB
•5334 DATA 237,60,60,60,63,63,0,0,0       BL
•5335 DATA 240,0,0,0,63,63,60,60,60       JI
•5336 DATA 245,60,60,120,240,240,120,60,6
0,999                                     HM
```

BIT MAP TUTORIAL
FROM PAGE 41

```
•1 REM BIT MAP TUTORIAL                   KI
•2 REM    WITH COLOR                      EI
•3 REM        BY                          CO
•4 REM MORTON KEVELSON                    ME
•10 POKE 56578,PEEK(56578) OR 3:REM SET C
IA FOR OUTPUT                             HJ
•15 A=0:REM VIDEO BANK 3 ($C000-$FFFF)    PL
•20 POKE 56576,(PEEK(56576) AND 252) OR A
:REM SELECT VIDEO BANK                    GH
•30 POKE 53265,PEEK(53265) OR 32:REM SET
HI-RES                                    KO
•40 OS=PEEK(53272):REM STORE ORIGINAL SCR
EEN LOCATION                              GD
•50 POKE 53272,PEEK(53272) OR 8:REM SET B
IT MAP OFFSET TO 8192                     BN
•60 POKE 53272,PEEK(53272) AND 15:REM SET
 SCREEN OFFSET TO 0                       IM
•70 BM=57344:REM START OF BIT MAP         EA
•80 SM=49152:REM START OF SCREEN          EE
•90 CM=55296:REM START OF COLOR MEM       KF
•100 BG=53281:REM BGROUND FOR MULTICOLOR  PH
•105 HN=0:LN=1:CN=6:BC=14:SC=HN*16+LN:REM
 START COLORS                             KD
•110 FOR I=0 TO 999:REM CLEAR SCREEN AND
SET COLORS                                CO
•120 POKE SM+I,SC:REM SET SCREEN COLORS   MB
•130 POKE CM+I,CN:REM SET COLOR MEM       IG
•140 NEXT I                               FB
•150 POKE BG,BC:REM SET BGROUND COLOR     FN
•160 FOR I=0 TO 7999:REM CLEAR BIT MAP    AJ
•170 POKE BM+I,0                          BO
•180 NEXT I                               HJ
•190 R1=11:REM START SCREEN ROW           HC
•200 R2=14:REM END SCREEN ROW             HK
•210 C1=18:C2=22:REM START & END COLUMN   GF
```

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```
·220 NB=(C2-C1)*8+7:REM NUMBER OF BYTES P
ER ROW                                       IK
·230 REM FILL PATTERNS                       BL
·235 DATA 102,68,85,170,204,99               OC
·240 CN=6:CT=CN:REM NUMBER OF FILL PATTER
NS                                           EL
·250 READ PT:CT=CT-1:IF CT=0 THEN CT=CN:R
ESTORE                                       IO
·260 GOSUB 1000                              FH
·270 GOSUB 2000                              FI
·280 GOTO 250                                DM
·1000 FOR RO=R1 TO R2:REM FILL WITH PATTE
RN                                           DO
·1010 FI=BM+RO*320+C1*8:REM CALC FIRST RO
W BYTE                                       KO
·1020 FOR J=0 TO NB:REM FILL ROW             LD
·1030 POKE FI+J,PT                           OJ
·1040 NEXT J                                 NI
·1050 NEXT RO                                EE
·1060 RETURN                                 LG
·2000 GET A$                                 NI
·2010 IF A$="[F1]" THEN POKE 53270,PEEK(5
3270) AND 239:REM F1=HI-RES                  KP
·2020 IF A$="[F3]" THEN POKE 53270,PEEK(5
3270) OR 16:REM F3=MULTI-COLOR               KB
·2030 IF A$="[F5]" THEN RETURN:REM F5=GET
 NEXT PATTERN                                DG
·2040 IF A$="[F7]" GOTO 3000:REM F7=QUIT     FL
·2050 IF A$="[F2]" THEN MM=SM:GOSUB4000:G
OSUB4100:REM HI-NYBBLE                       DL
·2060 IF A$="[F4]" THEN MM=SM:GOSUB4020:G
OSUB4100:REM LO-NYBBLE                       MC
·2070 IF A$="[F6]" THEN MM=CM:GOSUB4040:G
OSUB4100:REM COLOR MEM                       CN
·2080 IF A$="[F8]" THEN GOSUB4060:REM BGR
OUND NYBBLE                                  DB
·2090 GOTO2000                               ID
·3000 POKE 56576,(PEEK(56576) AND 252) OR
 3:REM RESTORE TEXT DISPLAY                  OK
·3010 POKE 53265,(PEEK(53265) AND 223)       PC
·3020 POKE 53270,PEEK(53270) AND 239         MJ
·3030 POKE 53272,OS:POKE BG,6:FOR I=0 TO
999:POKE CM+I,14:NEXT I                      OD
·3040 END                                    GL
·4000 HN=HN+1:IF HN>15 THEN HN=0             BO
·4010 CV=HN*16+LN:RETURN                     KD
·4020 LN=LN+1:IF LN>15 THEN LN=0             NK
·4030 GOTO 4010                              BJ
·4040 CN=CN+1:IF CN>15 THEN CN=0:CV=0:RET
URN                                          NG
·4050 CV=CN:RETURN                           HC
·4060 BC=BC+1:IF BC>15 THEN BC=0             PI
·4070 POKE BG,BC:RETURN                      HB
·4100 FOR RO=R1 TO R2                        JP
·4110 FS=MM+RO*40+CO                         JG
·4120 FOR CB=C1 TO C2                        HB
·4130 POKE FS+CB,CV                          FC
·4140 NEXT CB:NEXT RO                        KP
·4150 RETURN                                 NE
```

UNIVADERS

FROM PAGE 31

UNIVADERS BASIC

```
·0 DATA"A[3"0"]B169C255D032E141F208G011H2
12I010J007K192L144M173N201O008P012Q096R0
09"                                          CF
·1 DATA"S027T076U200V025W085X003Y160Z162[
189[EP]232]016[UPARROW]133[BACKARROW]153
:176;020<004=240>145"                        MD
·2 DATA"?172@001 157!165#002$013%014&015'
028(057)140*224+005-024.031/065[PI]"         OK
·3 DATA"GOCC158,50,48,((A49,OCC143,[9";"]
80,82,79,71,82,/77,D66,89,D82,79,"           HC
·4 DATA"66,69,82,84,D66,73,88,66,89,[3"A"
]T[RYA109,SH[BACKARROW]WX[BACKARROW]100,
XUK6,L242,ZAMSH-105,"                        DO
·5 DATA"@ 39,F[EP]*OL245,238,67,GM67,GNAF
X238,38,FQ;60,100,)180,220,+45,KBCE21,F"     DN
·6 DATA"E'FD77,GBXE?GBAE33,FEDFBAE29,FB14
7,D210,CB216,[UPARROW]DZAYABA[UPARROW].B
I>.UF251,[EP]230,"                           IF
·7 DATA"D*<L244,B142,D210,CBOD210,CYAB49,
[BACKARROW]228,J[BACKARROW]228,219,105,@
UK<L243,ZA109,SH"                            LN
·8 DATA"E37,FE38,F77,18,F41,127, %I[EP]*O
L234,B$ZA 248,J[EP]*OL248,YAZAMSH41,.121
,100,"                                       BM
·9 DATA"O AF[EP][EP]UKOL238,BKE]FYA185,22
,I[BACKARROW]64,XUK64,L245,YAB48,[BACKAR
ROW]KJ[BACKARROW]HJUK6,L243,B49,"            LM
·10 DATA"EHJQYAZA185,251,R=46,254,AF[AF=$
217,59,GL80,M]F(WIF17,[AFF67,185,WI$"        DL
·11 DATA"]FE]FT139,RBA[BACKARROW]251,RT13
9,R[3"2"],AF[AFNC=$217,51,G:DM]F(WI=19,[
AFNCF17,185,"                                FP
·12 DATA"WI77,]FE]FT139,RB@[BACKARROW]251
,R[EP][EP]UKOL151,QZAYA254,%I[%IN210,L17
,D205,GMSHE37,"                              CC
·13 DATA"FMSH41,. %I[BACKARROW]@F[EP]UUK]
L219,QB128,E%HE&HE18,HD109,OD37,RD147,RD
XID54,OD94,"                                 CG
·14 DATA"IDYID60,PD194,P238,68,GM68,GN#LG
BAE68,GD95,GD60,PT203,R[8"A"]ZAYO202,"       CM
·15 DATA"F253,136,F250,Q[9"A"]CA@CKXCKJA*
&A=.C248,63,C252,[6"A"][9"W"]A"              NH
·16 DATA"[5"A"]63,C254,223,C251,207,C243,
199,C227,195,-195,193,-131,K]X@#<O]D64,"     EI
·17 DATA"128,AM.FE93,IYAZAM93,I(WI=GBC[BA
CKARROW]%ID131,ID156,PU[EP][EP]KOL230,Q1
42,159,IZ<254,"                              LJ
·18 DATA"KJ[KJN58,LRB48, KJ202,T136,I174,
```

```
 159,IQAMA220,41,]FXD247,IMA220,41,&N"   PH
·19 DATA"P:&NRL+198,VT194,INO:#230,V!VN18
 7,LJB187,[UPARROW]VT215,IN152,:<B152,[UP
 ARROW]VBJ[UPARROW]26,"                  LO
·20 DATA"[UPARROW]'!V[UPARROW]SYABD>VUB79
 ,>VUB80,>VUBD>VQD127,PB30,E50,GDGGBDE50,
 GDGGQ!V[UPARROW]S!26,"                  KI
·21 DATA"[UPARROW]'!S56,233,40,[UPARROW]S
 :#198,'!'N+:@QM50,GY#>S136,>ST19,GA;VS'3
 0,21,22,D60,"                           PA
·22 DATA"59,58,64,63,62,/61,AA108,121,123
 ,117,126,120,124,118,MSHE170,GB<[UPARROW
 ]30,"                                   DG
·23 DATA"BA[UPARROW]29,E171,GQ?171,GUKOL#
 YA)171,GBD?170,G>29,152,-105,40,E170,GL#
 230,"                                   IP
·24 DATA"30,!30,NJL26,?170,G136,196,VFXDM
 G136,196,VFXDMGK[LXD77,G?171,G185,69,"  DG
·25 DATA"G?170,G>29,Q[3"A"]BD??G[BACKARRO
 W]228,J136,)?GKC=61,D156,PU)DF)33,FF247,
 [EP]F244,Q142,"                         PJ
·26 DATA"159,IZ+[KJN49,:O202,*C=-T210,GZ<
 [3"2"],KJ[KJN48,:RB( KJ202,T227,G174,159
 ,"                                      IC
·27 DATA"IQZA[40,P=JD210,C[EP]T252,GU)DFM
 18,FN58,LJN242,:X)33,F!197,N39,=JNVF228,
 "                                       BD
·28 DATA"T[RA19,'80,T/89,D/71,/73,78,63,D
 60,89,47,78,62,AM125,P56,237,SHE125,"   LN
·29 DATA"P:&206,126,PM126,PN22,:+B33,E126
 ,PM125,PEAHM126,PE@HBRE+HB132,E6,HB&"   MM
·30 DATA"E-HB33,E<HBDE<HQAABREPHB132,E$HB
 $E&HE%HB129,E18,HB128,E18,HQMSHERHEI"   JD
·31 DATA"HEPHB163,EJHBJEOHB132,E$HB/EGHB6
 4,EGHQZ<[3"2"],HJ[HJN48,:]B( HJ202,*CFX" CH
·32 DATA"T250,GT196,PQ[PI]"              OP
·200 DIMB(96):GOSUB201:END               GO
·201 READD$:FORI=1TOLEN(D$)STEP4:DE$=MID$
 (D$,I,4):D1$=LEFT$(DE$,1)               DA
·202 IFD1$="[PI]"THEN280                 CL
·203 D2$=RIGHT$(DE$,3):B(ASC(D1$))=VAL(D2
 $):NEXT:GOTO201                         AL
·280 N$="UNIVADERS":OPEN15,8,15,"S:"+N$:O
 PEN1,8,1,"0:"+N$+",P,W"                 JC
·290 PRINT#1,CHR$(001)CHR$(008);         LN
·300 READB$:FORA=1TOLEN(B$):A$=MID$(B$,A,
 1):IFA$=","THENB=VAL(C$):C$="":GOTO360  MG
·320 IFA$<":"ANDA$>"/"THENC$=C$+A$:NEXT  IO
·330 IFA$="[PI]"THEN370                  GO
·340 B=B(ASC(A$))                        DI
·360 C=C+B:PRINT#1,CHR$(B);:NEXT:GOTO300 BB
·370 IFC<> 132249 THENPRINT"CHECK FOR TYP
 ING ERROR":GOTO390                      CN
·380 PRINTN$" SAVED TO DISK"             GI
·390 CLOSE1:CLOSE15:RETURN               FN
```

Problems with an *Ahoy!* program? Call 212-239-6089
(If busy or no answer after three rings, call 212-239-0855)

DATA CREATOR FROM PAGE 58

DATA CREATOR 64

```
·100 REM* DATA CREATOR --- SHAWN K. SMITH IA
·110 S=00828:PRINTCHR$(147)"POKING DATA   FD
·120 FORD=STOS+190:READY:C=C+Y:POKED,Y    IB
·130 NEXT:DEFFNH(D)=INT(D/256)            LO
·140 DEFFNL(D)=D-FNH(D)*256:PRINT         MM
·150 IF C=26315 THEN180                   GO
·160 PRINT"?? WRONG DATA COUNT            CB
·170 PRINT"RECHECK DATA STATEMENTS":STOP  KP
·180 L=FNL(D):H=FNH(D)                    AH
·190 FORT=1TO3:READY:POKES+Y,L:POKES+Y+1,
 H:NEXT:D2=S+82:D4=FNL(S+184)             EE
·200 D=D+1:L=FNL(D):H=FNH(D):POKES+070,L  MI
·210 POKES+071,H:POKES+177,L:POKES+178,H  IJ
·220 POKES+73,FNL(D2):POKES+78,FNH(D2)    ND
·230 POKES+105,D4:POKES+107,FNH(S+184)    IE
·240 PRINT"SYS"S",STARTING LINE #, START
 ADDR., END ADDR., # OF VALUES PER LINE   PA
·250 END                                  HK
·260 DATA 032,253,174,032,138,173,032,247 MO
·270 DATA 183,132,251,133,252,032,253,174 MG
·280 DATA 032,138,173,032,247,183,132,172 NB
·290 DATA 133,173,032,253,174,032,138,173 DA
·300 DATA 032,247,183,132,195,133,196,032 KI
·310 DATA 241,183,134,253,138,240,010,165 IP
·320 DATA 195,197,172,165,196,229,173,176 MD
·330 DATA 003,076,072,178,173,002,003,141 KC
·340 DATA 191,192,173,003,003,141,192,192 NP
·350 DATA 169,082,141,002,003,169,192,141 PK
·360 DATA 003,003,165,253,133,254,166,251 BE
·370 DATA 165,252,032,205,189,024,165,251 CA
·380 DATA 105,010,133,251,144,002,230,252 EE
·390 DATA 169,184,160,192,032,030,171,160 ND
·400 DATA 000,177,172,170,152,032,205,189 OM
·410 DATA 165,173,197,196,208,006,165,172 DF
·420 DATA 197,195,240,038,032,219,252,198 CO
·430 DATA 254,240,007,169,044,032,210,255 LN
·440 DATA 208,221,036,145,016,020,032,215 AL
·450 DATA 170,169,002,133,198,169,145,141 HO
·460 DATA 119,002,169,013,141,120,002,108 FO
·470 DATA 191,192,173,191,192,141,002,003 PP
·480 DATA 173,192,192,141,003,003,208,222 FG
·490 DATA 032,068,065,084,065,032,000     EJ
·500 DATA 064,168,171:REM 4 RELOCATION    HL
```

DATA CREATOR 128

```
·100 REM* DATA CREATOR 128 FROM  AHOY!!   EB
·110 REM* (D)EVELOPED  BY  SHAWN K. SMITH DN
·120 S=5120:INC=10:ZS=0:TC=33306          NG
·130 PRINT:PRINT:PRINT"PLEASE WAIT[3"."]"
 ;                                        DB
·140 PRINT"STORING ML-CODE":PRINT:PRINT   GA
·150 BANK15:FORD=STOS+304:READY$          JN
```

```
·160 C=DEC(Y$):T=T+C:POKED,C:NEXT          AO
·170 PRINTCHR$(18);:IFT<>TCTHENBEGIN       OC
·180 PRINT"?DATA ERROR -RECHECK":END:BEND  OI
·190 M=S+129:H=INT(M/256):L=M-H*256        JL
·200 POKES+180,INC:FORD=1TO3:READY         LN
·210 POKES+Y,L:POKES+Y+1,H:NEXT            JN
·220 M=S+165:H=INT(M/256):L=M-H*256        CF
·230 POKES+156,L:POKES+161,H               IG
·240 IF ZS THENPOKES+217,56:REM SURPRESS   BF
·250 PRINT"TO ACTIVATE: SYS";S:END         MD
·260 DATA 20,81,92,12,53,59,4E,54,41,58    HJ
·270 DATA 3A,20,4C,49,4E,45,23,2C,42,45    ID
·280 DATA 47,49,4E,2C,45,4E,44,2C,42,59    JJ
·290 DATA 54,45,53,2C,42,4E,4B,2C,46,4F    IJ
·300 DATA 52,4D,41,54,1B,40,0D,0D,00,20    MK
·310 DATA 93,4F,86,3D,84,3E,20,80,03,20    AI
·320 DATA D7,77,20,15,88,84,FB,85,FC,20    FP
·330 DATA 5C,79,20,D7,77,20,15,88,84,AC    FF
·340 DATA 85,AD,20,5C,79,20,D7,77,20,15    KD
·350 DATA 88,84,C3,85,C4,20,81,14,86,FD    CE
·360 DATA 8A,F0,17,20,81,14,8A,29,0F,85    BE
·370 DATA AE,20,81,14,86,AF,A5,C3,C5,AC    CN
·380 DATA A5,C4,E5,AD,B0,11,4C,85,86,A2    EN
·390 DATA 0F,20,86,03,F0,06,20,5C,79,20    FP
·400 DATA F4,87,60,AD,02,03,8D,FE,02,AD    DP
·410 DATA 03,03,8D,FF,02,A9,A5,8D,02,03    GD
·420 DATA A9,14,8D,03,03,A5,FD,85,FE,A6    DE
·430 DATA FB,A5,FC,20,32,8E,18,A5,FB,69    AN
·440 DATA 0A,85,FB,90,02,E6,FC,20,81,92    KB
·450 DATA 20,44,41,54,41,20,00,A0,00,A9    HA
·460 DATA AC,A6,AE,20,74,FF,AA,A4,AF,D0    KO
·470 DATA 06,20,C2,B8,18,90,18,18,B0,10    NE
·480 DATA A9,30,E0,64,B0,0A,E0,0A,B0,03    MI
·490 DATA 20,D2,FF,20,D2,FF,A9,00,20,32    ON
·500 DATA 8E,A5,AD,C5,C4,D0,06,A5,AC,C5    IF
·510 DATA C3,F0,26,20,C1,EE,C6,FE,F0,07    HL
·520 DATA A9,2C,20,D2,FF,D0,BA,24,91,10    KA
·530 DATA 14,20,B4,B8,A9,02,85,D0,A9,91    PJ
·540 DATA 8D,4A,03,A9,0D,8D,4B,03,6C,FE    OM
·550 DATA 02,AD,FE,02,8D,02,03,AD,FF,02    OL
·560 DATA 8D,03,03,D0,DE                   MD
·570 DATA 112,104,96:REM DEC RELOCATE      JI
```

REVIEWS

Continued from page 72

since become known for his work with the C-128's 80 column bit map display. He is presently finishing up BASIC 8.0, which will be released this summer. BASIC 8.0 will add support of the 80 column bit map to the BASIC 7.0.

Chameleon recognizes more graphics file formats than any other conversion utility we looked at. As such *Chameleon* is an indispensable utility if you use the various packages it supports (or if you manage the *Ahoy! Art Gallery*).

CHAMELEON FILE FORMATS

HI-RES	MULTICOLOR
Cadpak	Animation Station
DOODLE!	Graphics BASIC
Flexidraw	Koala
Graphics BASIC	Koala Style
Logo	Micro Illustrator
Simons' BASIC	Peripheral Vision
Super Expander	Picasso's Revenge
The Tool	Simons' BASIC
Video BASIC	Super Expander
	Video BASIC

In addition to the above, *Chameleon* provides the C-64 Standard, its own graphics file format. This was supposed to provide a uniform graphics file format for C-64 users. The Koala Style file format is for image files which use the *Koala* file structure but do not adhere to the *Koala* file naming structure. If you come across a 40-block graphics file you cannot identify, try the Koala Style option. *Flexidraw* files come in two parts, one for the bit map and the other for the color data. *Chameleon* gives you the option of omitting the color data.

Chameleon will read and write any of the above file formats. However, the conversion from high-resolution to multicolor or vice versa lacks all intelligence. In *Chameleon* this conversion is purely on the file level. The extra color associated with a multicolor file is simply left off the high-resolution file. Conversely, default color data is added onto a multicolor file which is created from a high-resolution file. The result is generally of little use.

Included on the program disk are screen wedge programs for *Simons' BASIC*, *Super Expander*, and the standard C-64. These wedges add simple SYS commands for saving, loading, and viewing the bit map files when the C-64 is using the appropriate cartridge or for the C-64 Standard files created by *Chameleon*.

Chameleon is simple to use. All the commands, with a list of file formats, are displayed on the screen. The program prompts you when input is required. There is even a help screen with additional information. Files can be loaded, saved, and viewed. The disk directory can be viewed, and commands can be issued to the disk drive from within the program.

Loadstar, P.O. Box 30008, Shreveport, LA 71130-0008 (phone: 800-831-2694; in LA 318-868-7247).

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